

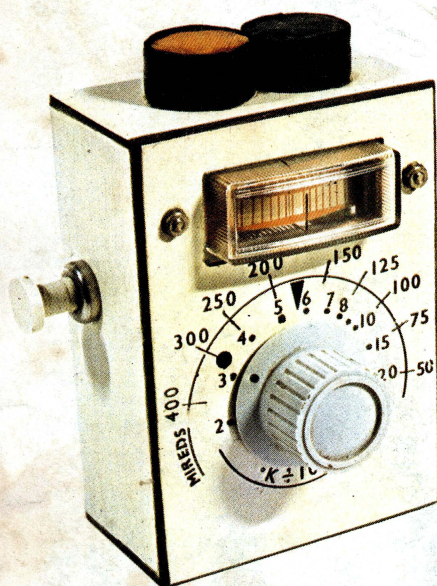
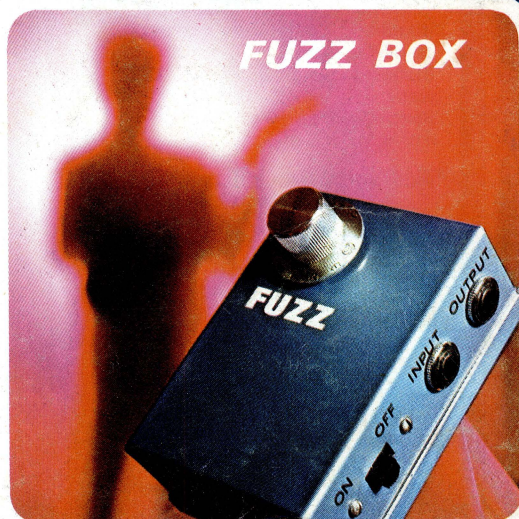
everyday electronics

DEC. 71

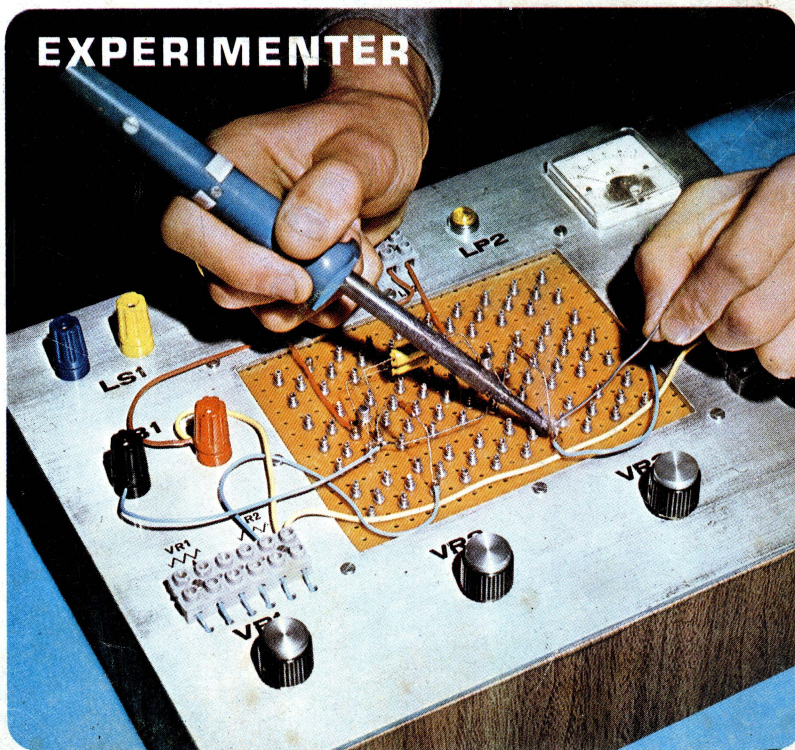
**A NEW MAGAZINE
BRINGING A FASCINATING
HOBBY TO EVERYONE**
PROJECTS EASY TO CONSTRUCT
THEORY SIMPLY EXPLAINED

**CIRCUIT BUILDING
DEMO-DECK
FOR THE BEGINNER**

Australia 40c
New Zealand 40c
South Africa 35c
Rhodesia 35c
East Africa 3/50
West Africa 3/6d
Sweden Kr. 3.00



**PHOTOGRAPHIC
COLOUR METER**



EXPERIMENTER

ADCOLA Soldering Instruments add to your efficiency

THE NEW 'INVADER'

ADCOLA L.646

for Factory Bench Line Assembly

A precision instrument—supplied with standard 3/16" (4.75 mm) diameter, detachable copper chisel-face bit*. Standard temp. 360°C at 23 watts. Special temps. from 250°C—410°C.

PRICE
£1.85

*Additional Stock Bits
(illustrated) available

COPPER

- B 38 $\frac{1}{8}$ " — 3.2 mm CHISEL FACE
- B 14 $\frac{1}{4}$ " — 2.4 mm CHISEL FACE
- B 24 $\frac{1}{8}$ " — 4.75 mm SCREWDRIVER FACE
- B 12 $\frac{1}{8}$ " — 4.75 mm EYELET BIT
- B 58 $\frac{1}{4}$ " — 6.34 mm CHISEL FACE

LONG LIFE

- B 42 LL $\frac{1}{8}$ " — 4.75 mm CHISEL FACE
- B 38 LL $\frac{1}{8}$ " — 3.2 mm CHISEL FACE
- B 14 LL $\frac{1}{4}$ " — 2.4 mm CHISEL FACE
- B 44 LL $\frac{1}{8}$ " — 4.75 mm SCREWDRIVER FACE



Don't take chances. We don't. All our ADCOLA Soldering Instruments are of impeccable quality. You can depend on ADCOLA day after day. That's why they're so popular. You get consistent good service... reliability... from our famous thermally controlled ADCOLA Element and the tough steel construction of this ideal production tool.

ADCOLA
(Regd Trade Mark)

ADCOLA PRODUCTS LTD.,
(Dept. Y), ADCOLA HOUSE, GAUDEN RD., LONDON, S.W.4.
Telephone: 01-622 0291/3 • Telegrams: Soljoint London Telex • Telex: Adcola London 21851

*
Write for
price list
and
catalogue

SAFELOC

of robust construction

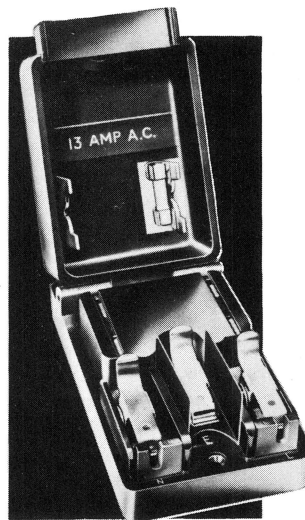
Safe, quick and secure it connects 2-core and 3-core bare-ended flexible leads to the mains (A.C. only).

The concept was pioneered by Rendar, and introduced to the market 13 years ago.

Safebloc saves time. No need to fit a plug for tests. No danger, as no current can pass with the lid open.

Invaluable for testing and demonstrations in industry and shops, the work bench and the home.

Ask for Safebloc at your local stockist — or you can order it direct from the manufacturer.



If ordering by post, send cash with order.

PRICE £2.60+10p P.&P. EACH

Special bulk order wholesale and industrial rates on application



RENDAR®

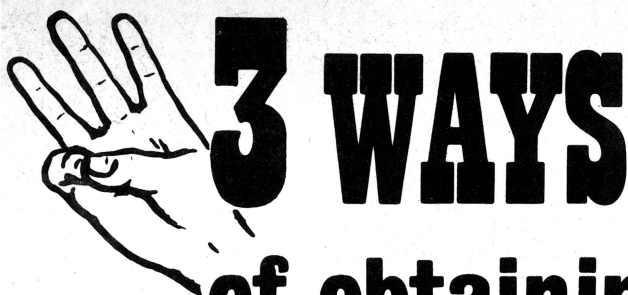
Rendar Instruments Ltd., Victoria Road,
Burgess Hill, Sussex. Tel. Burgess Hill 2642

Selections from FELSTEAD ELECTRONICS' List

(Sent free for stamped addressed envelope to address below)
Transistors etc. AC126 12ip. AF115 20p. AF116 15p. AF117 20p. OA5 7ip. OA10 7ip. OA81 7ip. OA85 7ip. OC23 32ip. OC25 30p. OC26 37ip. OC28 42ip. OC35 42ip. OC44 14p. OC45 12ip. OC71 12ip. OC72 12ip. OC75 12ip. OC81 12ip. OC81D 12ip. OC82D 12ip. OC170 20p. OC171 12ip. Many more in list. S.D.E. BY100 800piv 14p. 8 amp series: BY213 300piv 20p. BY212 600piv 25p. BY211 900piv 30p. BY210 1200piv 35p. (Charges 6ip up to 11, paid for 12 and over). Sub-Min Transformers: OUTPUT 3 Ω for OC72 etc.). 14p. DRIVER 15p (up to 6, 64p). SOLDERING IRON. Slim modern. British highspeed 8 1/2". All parts replaceable, highest quality, full guarantee: £1.07 1/2 (10p). DIAMOND STYLII Replacements for BSR TC8/LP, TC8/S, TC8LP/STEREO: COLLARO 'O': RONETTE BF 40LP: Garrard GC9/LP and GC8/LP: ACOS GP65/67 all at 40p (6p). ACOS GP73, GP91, GP91SC, GP104, BSR ST4 (ST3, ST5), ST5 (ST9): SONOTONE ST4, 9TA, 9TAHC: PHILIPS AG3306, 3060 (3063, 3066, 3301, 3302, 3304): Garrard GK825, GCM21, GCS23 and many more 'Garrard' etc. types. All at 75p. (6p). All are of the very highest quality DOUBLE DIAMOND: ST4 (ST3, ST5): ST10 (ST9, ST8): 9TA, 9TAHC, 3306, GP91 (For GP92, GP93, GP94 cartridges): GP91-SC for all GP91-SC Cartridges. All at £1.50 each (6p). SAPPHIRE STYLII. All those types shown above under 'Diamond StylII at 40p' also GP37 at 17ip each (6p) and GP91 and GP91SC at 40p (5p). No others. PICK-UP CARTRIDGES. All Standard fittings and stylII. Mono GP67/2 80p. STEREO-COMPATIBLE (MONO) GP91/SC £1.10 STEREO GP93 £1.30 STEREO CERAMIC GP94 £1.95 SONOTONE STEREO 9TAHC (DIA.) £2.40. RECORDING TAPE. Still the finest quality British Mylar available: Standard 5" 600ft. 36p. 5 1/2" 900ft. 50p. 7" 1200ft 56p. LONG PLAY 5" 900ft. 50p. 5 1/2" 1200ft. 56p. 7" 1800ft. 90p. (7ip on 5" and 5 1/2", 9p on 7"). Other sizes of Tapes, also Cassettes in list. MICROPHONES. Crystal Mic 91, hand/desktop 81p. MIC45. Curved metal hand-grip £1.00. CM21 Grey hand desk 62ip. Stick '60' £1.02. CM70 "Planet" machined metal tapered stick type with neck cord, adaptor to fit floor stands £1.47 1/2 (all 9p). LAPEL (or hand) with clip 32ip (6p). All are fitted with leads. Dynamic MS10 50K Ω for desk, tapered with base and slide-out adaptor £1.97 1/2. MS11. Similar, but fixed on swivel swan neck to switch-fitted base, £2.22 1/2 (Either 15p). Type 209 Cardioid ball, 50K/600 Ω. omni-dir., built-in vol. control, on/off switch, special lead, handle (as good as money can buy) £2.30. UDI30 Uni-Dir. Ball, mesh, 50K/600 Ω. Adap., cable, jack plug 24-80. (20p). DML60, omni-dir., Ball, 50K. Cable adaptor £3.87 1/2 (all at 27ip). MICROPHONE INSERTS. Dia., 1.75" OR 0.9" either size 27ip (6p). EARPIECES with lead and min. jack plug (2.5 or 3.5 mm., state which). Magnetic 9p Crystal (3.5 only) 24p (Up to 3 for 6p on any). HEADPHONES De-luxe STEREO 8-16 Ohms £2.47 1/2. Same, fitted vol. control each earpiece £4.20. Both have lead and stereo jack plug (17ip). High Res. 2000 ohm. Adjustable 92ip (7ip). SPEAKERS 12" ROUND fitted tweeter, 3 or 15 Ω (state which) £1.87 1/2 (27ip) or for Stereo £4.25 pair, carr. paid. 21" 3 OR 8 Ω (state which) 87ip (6p). EMI 13" X 8", 3, 8 or 15 Ω (state which) £2.12 1/2 (25p) with two tweeters and crossover network 15 Ω £3.75 (25p). VIBRATORS. 12V 4-pin non-synch. 121HD4, 21" ex. pins 27ip. 12V 7-pin Synch. (12SR7) 62ip. (Both types 6ip per vibrator). CONNECTING WIRE. Packs of 5 coils asstd. coils. ea. coil 5yds. Solid core 14p (6p). Flexible 16p (7ip). Super thin for transistor wiring 16p (6p). PICK-UP WIRE. Super thin twin flex. screened and sheathed 6p yd. (6p up to 6yds.—over free). RETRACTABLE Flex Leads. (Curties) Phonoplug each end 12ft. 39p. S.A.E. phone plug/phone socket other end 25p. 12ft 42ip (6p per lead all types). SEND S.A.E. for full free list of mains eliminators, amplifiers, extension aeriels (car and portable), electrolytics, vol. controls, more microphones, transistors, thyristors and SDR's and other devices, switches of many types, rotary toggle min. and sub-min. slide types, multitest meters, panel meters, all types of British and continental plugs and sockets, croc. clips, terminals, valve holders also Goldring G800 series cartridges etc., etc. 'Special Offer' lines at very low prices.

FELSTEAD ELECTRONICS (EE. 2)
LONGLEY LANE, GATLEY, CHEADLE, CHES. SK8 4EE

Cash with order only. No COD or Caller Service. Charges (Min. 6p) in brackets after all items. Regret Orders under 20p excluding postage, unacceptable. SAE please for enquiries or cannot be replied to. Charges apply G.B. and Eire only. Overseas orders welcomed (lists free overseas).



HOME RADIO (Components) LTD.

Dept. EE, 234-240 London Rd.,

Mitcham, CR4 3HD. 01-648 8422

of obtaining components quickly & easily

1

**CALL AT No.240
London Rd., Mitcham**

If you live within easy reach of Mitcham or are in the area at any time do call on us. We are almost opposite Mitcham Baths. We open 9 a.m. every weekday. On Wednesdays we close 1 p.m. and all other days, including Saturdays, 5.30 p.m. On Saturdays we have extra staff to deal with queries. We carry a vast stock of components, and 999 times out of a 1,000 we can immediately lay our hands on the particular item required.

2

**JOIN OUR CREDIT
ACCOUNT SERVICE**

We began our Credit Account Service about 18 months ago and it has proved extremely popular. Little wonder! Our customers find it a very simple and convenient way of purchasing all their radio and electronic needs. We supply pre-paid envelopes and order forms and no matter how many orders you send us you make only one payment per month. There are several other advantages with our Credit Account Service. Please write or phone for details.

The price of 70p applies only to catalogues purchased by customers in the U.K. and to BFPO addresses.

3

**and
ORDER BY MAIL
OR TELEPHONE**

Although we are kept busy selling "over the counter" we supply even more by Mail Order. You can telephone any time of day or night, Sundays included. If you ring out of office hours a recording machine takes your message for us to deal with as soon as we open shop again. Our number is 01-648 8422. If you wish to order by post our address is in the panel at the top of the page. We deal with all orders promptly.



**WHICHEVER WAY YOU
CHOOSE you need the
Home Radio Catalogue**

In its 315 pages are listed over 8,000 components, over 1,500 of them illustrated. Each copy contains 10 Vouchers, each worth 5p when used as instructed. Free Supplements are supplied regularly to keep you up-to-date. The Catalogue costs 50p over the counter, or 70p including postage and packing.

**Post this Coupon with
Cheque or PO for 70p**

Please write Name and Address in block capitals.

Name

Address



HOME RADIO (Components) LTD.

Dept. EE, 234-240 London Rd., Mitcham, CR4 3HD

YATES ELECTRONICS

(FLITWICK) LTD.

RESISTORS

1W Iskra high stability carbon film—very low noise—capless construction.
1W Mullard CR25 carbon film—very small body size 7.5 x 2.5mm. 4W Erie wire wound.

Power watts	Tolerance	Range	Valves available	Price
1/2	5%	4-7Ω-2.2MΩ	E24	1-99 100+
1	10%	3-3MΩ-10MΩ	E12	1-0p 0-8p
2	10%	1Ω-3-9Ω	E12	1-0p 0-8p
4	5%	4-7Ω-1MΩ	E12	1-0p 0-8p
	10%	1Ω-10Ω	E12	6p 5-5p

Quantity price applies for any selection. Ignore fractions on total order.

DEVELOPMENT PACK

0.5 watt 5% Iskra resistors 5 off each value 4.7Ω to 1MΩ.
E12 pack 325 resistors £2.40. E24 pack 650 resistors £4.70.

POTENTIOMETERS

Carbon track 5kΩ to 2MΩ, log or linear (log 1/2W, lin 1/4W).
Single, 12p. Dual gang (stereo), 40p. Single D.P. switch 24p.

SKELETON PRESET POTENTIOMETERS

Linear: 100, 250, 500Ω and decades to 5MΩ. Horizontal or vertical P.C. mounting (0.1 matrix).
Sub-miniature 0.1W, 5p each. Miniature 0.25W, 6p each.

SEMICONDUCTORS

AC126	12p	BFY52	22p	OC81	12p	2N3055	72p
AC127	12p	BSY56	30p	OC82	12p	2N3702	15p
AC128	12p	BSX21	25p	ORP12	48p	2N3703	14p
AD140	40p	BY124	7 1/2p	IN4001	7 1/2p	2N3704	17 1/2p
AF115	20p	BYZ10	20p	IN4002	10p	2N3705	15p
AF117	20p	BYZ13	20p	IN4003	11p	2N3706	12p
BC107	10p	OA85	7p	IN4004	12p	2N3707	18 1/2p
BC108	10p	OA91	5p	IN4005	13p	2N3708	10p
BC109	10p	OA202	7p	IN4006	13p	2N3709	11p
BFY50	22p	OC71	12p	IN4007	13p	2N3710	12p
BFY51	22p	OC72	12p	2N2926	11p	2N3711	14p

ZENER DIODES

400mW 5% 3-3V to 30V, 15p.

ROTARY SWITCHES

2P2W, 1P12W, 2P6W, 3P4W, 4P3W, 23p.

BRUSHED ALUMINIUM PANELS

12in x 6in=25p; 12in x 2 1/2in=10p; 9in x 2in=7p.

DEPT. E.E.

ELSTOW STORAGE DEPOT,
KEMPSTON HARDWICK,
BEDFORD.

C.W.O. PLEASE. POST AND PACKING. PLEASE ADD 10p TO ORDERS UNDER £2.

Catalogue which contains data sheets for most of the components listed will be sent free on request. 5p stamp appreciated.

10% DISCOUNT TO ALL CALLERS ON SATURDAYS

MULLARD POLYESTER CAPACITORS C296 SERIES

400V: 0.001μF, 0.0015μF, 0.0022μF, 0.0033μF, 0.0047μF, 2 1/2p. 0.0068μF, 0.01μF, 0.015μF, 0.022μF, 0.033μF, 3p. 0.047μF, 0.068μF, 0.1μF, 4p. 0.15μF, 6p. 0.22μF, 7 1/2p. 0.33μF, 11p. 0.47μF, 13p.
160V: 0.01μF, 0.015μF, 0.022μF, 0.033μF, 0.047μF, 0.068μF, 3p. 0.1μF 3 1/2p. 0.15μF, 4 1/2p. 0.22μF, 5p. 0.33μF, 6p. 0.47μF, 7 1/2p. 0.68μF, 11p. 1.0μF, 13p.

MULLARD POLYESTER CAPACITORS C280 SERIES

250V P.C. mounting: 0.01μF, 0.015μF, 0.022μF, 3p. 0.033μF, 0.047μF, 0.068μF 3 1/2p. 0.1μF, 4p. 0.15μF, 0.22μF, 5p. 0.33μF, 6 1/2p. 0.47μF, 8 1/2p. 0.68μF, 11p. 1.0μF, 13p. 1.5μF, 20p. 2.2μF, 24p.

MYLAR FILM CAPACITORS 100V.

0.001μF, 0.002μF, 0.005μF, 0.01μF, 0.02μF, 2 1/2p. 0.04μF, 0.05μF, 0.068μF, 0.1μF, 3p.

CERAMIC DISC CAPACITORS

100pF to 10,000pF, 2p each.

CAPACITOR DEVELOPMENT PACK

Selection of 100 ceramic and polyester capacitors, 100pF to 1.0μF, £2.90.

ELECTROLYTIC CAPACITORS—MULLARD C426 SERIES

(μF/V) 10/2.5, 40/2.5, 80/2.5, 160/2.5, 500/2.5, 8/4, 32/4, 64/4, 125/4, 250/4, 400/4, 6.4/6.4, 25/6.4, 50/6.4, 100/6.4, 200/6.4, 320/6.4, 4/10, 16/10, 32/10, 64/10, 125/10, 200/10, 2.5/16, 10/16, 20/16, 40/16, 80/16, 125/16, 1.6/25, 6.4/25, 12.5/25, 25/25, 50/25, 80/25, 1/40, 4/40, 8/40, 16/40, 32/40, 50/40, 0.64/64, 2.5/64, 5/64, 10/64, 20/64, 32/64. 6p each

ELECTROLYTIC CAPACITORS Miniature P.C. mounting

(μF/V): 10/12, 50/12, 100/12, 200/12, 5/25, 10/25, 25/25, 100/25. 5p each.

VEROBOARD

2 1/2 x 3 1/2	0-1	0-15
2 1/2 x 5	22p	17p
2 1/2 x 5	24p	21p
3 1/2 x 3 1/2	24p	21p
3 1/2 x 5	28p	28p
17 x 3 1/2	75p	57p
17 x 5	100p	78p
17 x 5 (plain)	—	82p
17 x 3 1/2 (plain)	—	60p
17 x 2 1/2 (plain)	—	42p
2 1/2 x 5 (plain)	—	12p
2 1/2 x 3 1/2 (plain)	—	11p
Pin insertion tool	52p	52p
Spot face cutter	42p	42p
Pkt. 50 pins	20p	20p

JACK PLUGS AND SOCKETS

Standard screened	18p	2.5mm insulated	8p
Standard insulated	12p	3.5mm insulated	8p
Stereo screened	35p	3.5mm screened	13p
Standard socket	15p	2.5mm socket	8p
Stereo socket	18p	3.5mm socket	8p

D.I.N. PLUGS AND SOCKETS

2 pin, 3 pin, 5 pin 180°, 5 pin 240°, 6 pin
Plug 12p. Socket 8p.

BATTERY ELIMINATOR

9V mains power supply. Same size as PP9 battery. £1.50

The Unique MULTI-MINI TWIN-VICE



An extra "Pair of hands" for those tricky jobs

ASSEMBLY—SOLDERING—GLUING—WIRING—DRILLING ETC.

- INDEPENDENT ADJUSTMENT OF THE TWO VICE HEADS TO ANY ANGLE WITH POSITIVE LOCKING.
- JAWS WILL FIRMLY GRIP, ROUND, FLAT, SQUARE, OR HEXAGONAL PARTS.

TWIN VICE: £5.90 (24p P & P)

ALSO AVAILABLE

SINGLE VICE: £3.37 1/2 (20p P & P)

COVENTRY MOVEMENT CO LTD.

Dept. E.2

BURNSALL ROAD, COVENTRY
CV5 6BJ STD 0203-74363

EX COMPUTER PRINTED CIRCUIT PANELS

2in x 4in packed with semi-conductors and top quality resistors, capacitors, diodes, etc. Our price 10 boards 50p, P. & P. 7p. With a guaranteed minimum of 35 transistors. Data on transistors included.

SPECIAL BARGAIN PACK. 25 boards for £1, P. & P. 18p. With a guaranteed minimum of 85 transistors. Data on transistors included.

PANELS with 2 power transistors similar to OC28 on each board—components 2 boards (4 x OC28) 50p, P. & P. 6p.

9 OA5, 3 OA10, 3 Pot Cores, 26 Resistors, 14 Capacitors, 3 GET 872, 3 GET 872B, 1 GET 875. All long leaded on panels 13in x 4in. 4 for £1, P. & P. 25p.

709C OPERATIONAL AMPLIFIER TO5

8 lead I.C. 1 off 50p. 50 off 85p. 100 off 80p.

250 MIXED RESISTORS 62p

1/2 & 1/4 watt.

150 MIXED HI STABS 62p

1/2, 1/4 & 1 watt 5% & better.

QUARTZ HALOGEN BULBS

With long leads. 12V 55W for car spot lights, projectors, etc. 50p each. P. & P. 5p.

GPO EXTENSION TELEPHONES

with dial but without bell. 95p each. P. & P. 30p. £1.75 for 2. P. & P. 50p.

BARGAIN RELAY OFFER

Single pole change over silver contacts 25V to 50V. 2-5kΩ coil. 8 for 50p. P. & P. 5p.

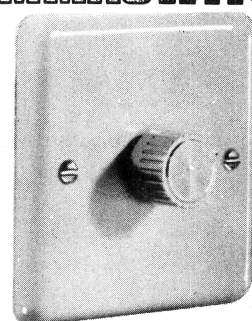
KEYTRONICS mail order only

44 EARLS COURT ROAD

LONDON, W.8

01-478 8499

Vary the strength of your lighting with a DIMMASWITCH

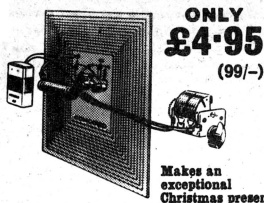


The DIMMASWITCH is an attractive and efficient dimmer unit which fits in place of the normal light switch and is connected up in exactly the same way. The ivory mounting plate of the DIMMASWITCH matches modern electric fittings. Two models are available, with the bright chrome knob controlling up to 300 w or 600 w of all lights except fluorescents at mains voltages from 200-250 v, 50Hz. The DIMMASWITCH has built-in radio interference suppression:

600 Watt—£3.20. Kit Form £2.70
300 Watt—£2.70. Kit Form £2.20

All plus 10p post and packing.
Please send C.W.O. to:—

DEXTER & COMPANY
5 ULVER HOUSE, 19, KING STREET,
CHESTER CH1 2AH Tel: 0244-25883,
As supplied to H.M. Government Departments.



ONLY £4.95 FIND BURIED TREASURE WITH THIS READY BUILT & TESTED (99/-) Treasure Locator Module

BRAND NEW FULLY TRANSISTORISED PRINTED CIRCUIT METAL DETECTOR MODULE. Ready built and tested—just plug in a PP3 battery and it's working. Put it in a case, screw a handle on and you have a **PORTABLE TREASURE LOCATOR EASILY WORTH ABOUT £80!** Extremely sensitive—penetrates through earth, sand, rock, wood, dirt, water, etc.—**EASILY LOCATES COINS, GOLD, SILVER, WATCHES, JEWELLERY, NUGGETS, METALLIC ORE, HISTORICAL RELICS, BURIED PIPES, KEYS, NAIL-IN-TREES, ETC., ETC.** Signals exact location by "beep" pitch increasing as you near buried metallic objects. **PRINTED CIRCUIT SEARCH COIL** so stable and sensitive it will detect certain objects buried **SEVERAL FEET BELOW GROUND! GIVES CLEAR SIGNAL ON ONE COIN!** You could even pay for your holidays with two or three days electronic beachcombing—it's almost like having a license to print money! Unclaimed treasure now exceeds the combined wealth of all nations. **ORDER NOW WHILE PRESENT STOCKS LAST—TREMENDOUS DEMAND EXPECTED AT THIS REMARKABLY LOW PRICE. DEMONSTRATIONS DAILY. ORDERS DESPATCHED IN STRICT ROTATION. SEND NOW £4.95+80p carr. (80/-+6/-) etc.** (High quality Danish Stethoscope headphones £2.75 (55/-) extra if required).

SOOTHE YOUR NERVES, RELAX WITH THIS AMAZING RELAXATRON

CUTS OUT NOISE POLLUTION—SOOTHS YOUR NERVES! Don't underestimate the use of this fantastic new design—the **RELAXATRON** is basically a pink noise generator based on avalanche operated transistors. Beside being able to mask out extraneous unwanted sounds, it has other very interesting properties. For instance, many people find a rainstorm mysteriously relaxing, a large part of this feeling of well-being can be directly traced to the sound of falling raindrops!—a well known type of pink noise. *A group of Dentists have experimented on patients with this pink noise—NO ANESTHETICS WERE USED!* The noise ostensibly created a most definite reaction on these patients, nervous systems with the results that their pain systems were blocked. **IF YOU WORK IN NOISY OR DISTRACTING SURROUNDINGS, IF YOU HAVE TROUBLE CONCENTRATING, IF YOU FEEL TENSED, UNABLE TO RELAX—** then build this fantastic Relaxatron. Once used you will never want to be without it—use this amazing pink noise generator whenever you feel uneasy, can't relax or wish to concentrate. **TAKE IT ANYWHERE, pocket sized.** Uses standard PP3 batteries (current used so small that battery life is almost shelf-life) **CAN BE EASILY BUILT BY ANYONE OVER 12 YEARS OF AGE** using our unique, step-by-step, fully illustrated plans. No soldering necessary. All parts including case, (a pair of crystal phones, Components, Nuts, Screws, Wire, etc. etc. no soldering. **SEND NOW £2.25+25p (45/-+5/-) p. & p.** parts available separately.)

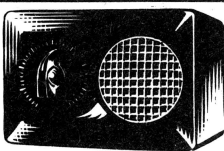


SHORTWAVE TRANSISTOR RADIO Can be built in one evening

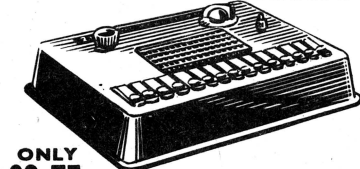
At last! After trying countless circuits searching for easy build, work first-time short wave. Giving advanced world-wide performance, we chose this 'Sky Roma'. Anyone from 9 years up can follow the step-by-step, easy-as-ABC, fully illustrated instructions. (We built ten prototypes and everyone worked first time) no soldering necessary. 76 stations logged on rod aerial in 30 mins.—Russia, Africa, USA, Switzerland, etc. Experience thrills of world wide news, sport, music, etc. **Eavesdrop on unusual broadcasts.** Uses PP3 battery. Transistorised (no valves). Size only 3" x 4" x 1 1/2". As tremendous demand anticipated price held to only **£2.25 (45/-)+17p (3/6) p. & p.** for all parts incl. Cabinet, screws, instructions etc. (Parts available separately.)

GET A GOOD NIGHT'S SLEEP—EVERY NIGHT! INGENIOUS ELECTRONIC SLEEP INDUCER

CAN'T SLEEP AT NIGHT? DO YOU WAKE UP IN THE NIGHT AND CAN'T GET OFF TO SLEEP AGAIN? WOULD YOU LIKE TO BE GENTLY SOOTHED OFF TO SATISFYING SLEEP EVERY NIGHT? Then build this ingenious electronic sleep inducer. *It even stops by itself so you don't have to worry about it being on all night.* The loudspeaker produces soothing audio-frequency sounds, continuously repeated—but as time goes on the sounds gradually become less and less—until they eventually cease altogether, the effect it has on people is amazingly very similar to hypnosis. A control is provided for adjusting the length of times etc., all transistor, can be built by anyone over 12 years of age in about two hours. No knowledge of electronics or radio needed. Extremely simple, easy-to-follow, step-by-step, fully illustrated instructions included. **No soldering necessary.** Works off standard batteries—extremely economical. Size only 3" x 4" x 1 1/2"—take it anywhere. All parts including case, loudspeaker, components, nuts, wire, screws, etc. etc. **THERE WILL BE A GREAT DEMAND FOR THIS UNIQUE NEW DESIGN—SEND NOW £2.75+25p (55/-+5/-) p. & p.** (parts available separately.)



REAL WORKING ELECTRONIC ORGAN



Don't confuse with ordinary electric organs that simply blow air over mouth-organ type reeds etc. Eight months were spent in creating and testing this superb, revolutionary electronic organ. Fully transistorised—no valves. Proper self-contained loudspeaker. Fifteen separate keys span two full octaves—play the "Yellow Rose of Texas", play "Silent Night", play "Auld Lang Syne", play lots and lots of similar tunes on this real working electronic organ. Although it's no theatre organ it's certainly no tiny thing, it measures 13 1/2" x 10" x 2 1/2". You have the thrill and excitement of building it together with the pleasure of playing a real, live, throbbing electronic organ. **Take it anywhere—play it anywhere, NO PREVIOUS KNOWLEDGE OF ELECTRONICS NEEDED—NONE WHATSOEVER.** No soldering necessary. It really is as simple as a.b.c. to make. Anyone from nine years upwards can build it easily in one short evening following the fully illustrated, step-by-step, simply worded instructions. **BIG DEMAND ANTICIPATED FOR THIS UNIQUE INSTRUMENT** at our low, low building price, **ONLY £2.75 (55/-)+23p (4/6) p. & p.** for all parts, including case, loudspeaker, transistors, condensers, resistors, knobs, transformer, volume control, wire, nuts, screws, simple (but full) instructions, etc., etc. Uses standard battery (parts available separately). Have all the pleasure of making it yourself, finish with an exciting Christmas gift for someone.

ONLY £2.75 (55/-)

EAVESDROP ON THE EXCITING WORLD OF AIRCRAFT COMMUNICATIONS—JUST OUT V.H.F. AIRCRAFT BAND CONVERTER



Makes fantastic Christmas Gift Many thousands of V.H.F. Aircraft Band Converters now selling in U.S.A. Listen in to AIRLINES, PRIVATE PLANES, JETPLANES. Eavesdrop on exciting crosstalk between pilots, ground approach control, airport tower. Hear for yourself the disciplined voices hiding tenseness on talk downs. Be with them when they have to take nerve rippling decisions in emergencies—Tune into the international distress frequency. Covers the aircraft frequency band including HEATHROW, GATWICK, LUTON, RINGWAY, PRESTWICK ETC., ETC. CLEAR AS A BELL. This fantastic fully transistorised instrument can be built by anyone nine to ninety in under two hours. (Our design team built four—everyone worked first time). **No knowledge of radio or electronics required.** No soldering necessary. Fully illustrated simply worded instructions take you step-by-step. Uses standard PP3 battery. Size only 4 1/2" x 3" x 1 1/2". All you do is extend rod aerial, place close to any ordinary medium-wave radio (even tiny portables) **NO CONNECTIONS WHATSOEVER NEEDED.** Use indoors or outdoors. **THERE WILL BE ENORMOUS DEMAND FOR THIS NEW DESIGN, SEND NOW, ONLY £2.37 (47/6) + 23p (4/6) p. & p.** for all parts, including case nuts, screws, wire, etc., etc. (Parts available separately)

ONLY £2.37 (47/6)

FIND BURIED TREASURE! TREASURE LOCATOR TRANSISTORISED

NOW IT'S HERE AT LAST, after experimenting for four and a half months with a multitude of different circuits and carrying out actual field tests with prototype, our design team have come up with this real winner. This fully portable transistorised metal locator detects and tracks down buried metal objects—it signals exact location with loud audible sound (no phones used)—uses any transistor radio which fits inside—no connections needed. **FINDS GOLD, SILVER, LOST COINS, JEWELLERY, KEYS, WAR SOUVENIRS, ARCHAEOLOGICAL PIECES, METALLIC ORE, NUGGETS ETC., ETC.** Outdoors or indoors. **Extremely sensitive, will signal presence of certain objects buried several feet below ground.** No knowledge of radio or electronics required. **Can be built with ease in one short evening by anybody from nine years of age upwards,** with the wonderfully clear, easy to follow, step-by-step, fully illustrated instructions—it really is easy as A.B.C. Transistorised—no valves. Uses standard PP3 battery. No soldering necessary. Size of detector head 13 1/2" x 10" x 2 1/2". Great demand expected at this remarkably low price—**ORDER WHILE PRESENT STOCKS LAST.** All parts including detector head case, nuts, screws, wire, simple instructions etc., etc. **ONLY £2.37 (47/6) + 27p (5/6) p. & p.** (Sectional handle as illustrated 75p (15/-) extra). **Parts available separately.** Made up looks worth £15



ONLY £2.37 (47/6)

BUILD 5 RADIO AND ELECTRONIC PROJECTS



TOTAL BUILDING PRICE £1.97 (39/6)

Makes an exciting Christmas present Amazing Radio Construction set! Become a radio expert for £1.97 (39/6). A complete Home Radio kit. No experience needed. Parts including simple instructions for each design. Illustrated step-by-step plans, all Transistors, loudspeaker, personal phone, knobs, screws, etc. all you need. Presentation Box 77p (7/6) extra as illus. (if required) (extra parts available separately) No soldering necessary. Send only **£1.97 (39/6)+23p (4/6) p. & p.**

EXAMINE AT HOME FOR 7 DAYS. YOUR MONEY REFUNDED IN FULL IF NOT 100% DELIGHTED.
CONCORD ELECTRONICS LTD (Dept. EE12) 8 Westbourne Grove, London W.2.
(STAFF WANTED FOR ALL DEPARTMENTS) (Nr. Bayswater & Queensway Tubes. 1 minute ABC Cinema)
Callers welcome 9 a.m.-6 p.m. inc. Saturday

Sinclair Q16/Micromatic

Q16 High fidelity loudspeaker

The Q16 employs the well proven acoustic principles specially developed by Sinclair in which a special driver assembly is meticulously matched to the characteristics of the uniquely designed cabinet. In reviewing this exclusive Sinclair design, technical journals have justly compared the Q16 with much more expensive loudspeakers. Its shape enables the Q16 to be positioned and matched to its environment to much better effect than is the case with conventionally styled enclosures. A solid teak surround with a special all-over cellular foam front is used as much for appearance as its ability to pass all audio frequencies without loss.

This elegantly designed shelf mounting speaker brings genuine high fidelity within reach of every music lover.

Specifications:

Construction: Special sealed seamless sound or pressure chamber with internal baffle.

Loading: up to 14 watts RMS.

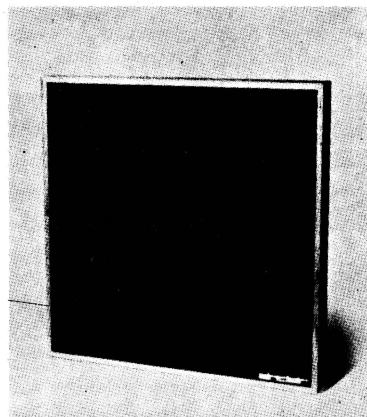
Input Impedance: 8 ohms.

Frequency response: From 60 to 16,000 Hz. confirmed by independently plotted B and K curve.

Driver unit: Special high compliance unit having massive ceramic magnet of 11,000 gauss, aluminium speech coil and special cone suspension for excellent transient response.

Size and styling: 9½ in. square on face x 4½ in. deep with neat pedestal base. Black all over cellular foam front with natural solid teak surround.

Price £8.98.



Britain's smallest radio

Considerably smaller than an ordinary box of matches, this is a multi-stage AM receiver brilliantly designed to provide remarkable standards of selectivity, power and quality for its size. Powerful AGC counteracts fading from distant stations; bandspread at higher frequencies makes reception of Radio 1 easy. The plug-in magnetic earpiece provided, matches the Micromatic's output to give wonderful standards of reproduction. Everything including the special ferrite rod aerial and batteries is contained within the minute attractively designed case. Whether you build a Micromatic kit or buy this amazing receiver ready built and tested, you will find it as easy to take with you as your wrist watch, and dependable under the severest listening conditions.

Specifications:

Size: 36 x 33 x 13 mm (1.8 x 1.3 x 0.5 in.)

Weight: including batteries, 28.4 gm (1 oz.)

Case: Black plastic with anodised aluminium front panel and spun aluminium dial.

Tuning: medium wave band with bandspread at higher frequencies (550 to 1,600 KHz).

Earpiece: Magnetic type.

On/off switching: By inserting and withdrawing earpiece plug.

Kit in pack with earpiece, case, instructions and solder **£2.48.**

Ready built, tested and guaranteed, with earpiece **£2.98.**

Two Mallory Mercury batteries type RM675 required from radio shops, chemists, etc.



To: SINCLAIR RADIONICS LTD LONDON ROAD ST. IVES HUNTINGDONSHIRE PE17 4HJ

Please send

Name

Address

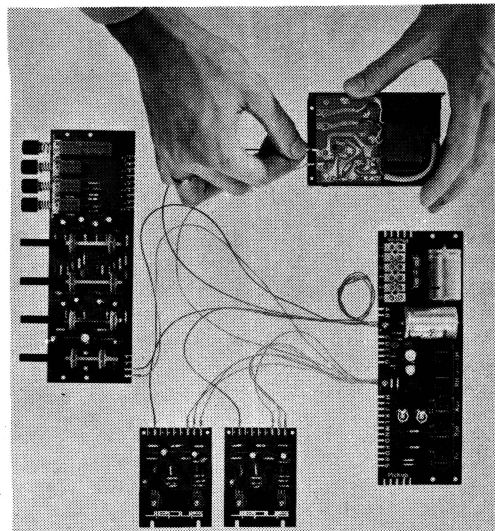
for which I enclose cash/cheque/money order

E.E. 2A

Sinclair Radionics Ltd., London Rd, St. Ives
Huntingdonshire PE17 4HJ.
Telephone St. Ives (048 06) 4311

sinclair

Project 605 the new simple way to assemble Sinclair high fidelity modules



For several years now you have been able to assemble your own high fidelity system to world beating standards using Sinclair modules. We have progressively improved these technically but hitherto the method of assembly at your end has remained the same – there has been no alternative to a soldering iron. Now for those who prefer not to solder, there is an alternative – Project 605.

In one neat package you can now obtain the four basic Project 60 modules plus a fifth completely new one – Masterlink – which contains all the input sockets and output components you previously bought separately. Also in the Project 605 pack are all the inter-connecting leads, cut to length and fitted at each end with plugs which clip straight onto the modules, eliminating soldering completely. The pack contains everything you need to build a complete 30 watt stereo amplifier together with a clear well illustrated Instruction Book. All you have to do is to arrange your modules in the plinth or case of your choice and then clip them together – the work of a few minutes.

Your hi-fi system will, as we said, match the finest in the world and you can add to it at any time to increase power or extend the facilities. For example a superb stereo FM Tuner unit is obtainable for only £25.

Guarantee If within 3 months of purchasing Project 605 directly from us, you are dissatisfied with it, we will refund your money at once. Each module is guaranteed to work perfectly and should any defect arise in normal use we will service it at once and without any cost to you whatsoever provided that it is returned to us within 2 years of the purchase date. There will be a small charge for service thereafter. No charge for postage by surface mail, Air-mail charged at cost.

sinclair

Sinclair Radionics Ltd., London Road,
St. Ives, Huntingdonshire PE17 4HJ.
Telephone: St. Ives (04806) 4311

Everyday Electronics, December 1971

Specifications

Output – 30 watts music power (10 watts per channel R.M.S. into 3 Ω).

Inputs – Mag. P.U. – 3mV correct to R.I.A.A. curve 20–25,000 Hz \pm 1dB. Ceramic pick-up – 50mV. Radio – 50 to 150mV. Aux. adjustable between 3mV. and 3V.

Signal to noise ratio – Better than 70dB.

Distortion – better than 0.2% under all conditions.

Controls – Press buttons for on-off, P.U., radio and aux. Treble +15 to –15 dB at 10 kHz. Bass +15 to –15 dB at 100 Hz. Volume. Stereo Balance.

Channel matching within 1dB.

Front panel – brushed aluminium with black knobs.

Project 605 comprises Stereo 60 pre-amp/control unit, two Z-30 power amplifiers, PZ-5 power supply unit, the unique new Masterlink, leads and instructions manual complete in one pack. Post free

£29.95

To SINCLAIR RADIONICS LTD., ST. IVES, HUNTINGDONSHIRE PE17 4HJ

Please send Project 605 post free ☐ Details and list of stockists ☐

Name

Address

for which I enclose £29.95 cheque/money order/cash.

E.E. 28

CRESCENT RADIO LTD

11 & 40 MAYES ROAD, LONDON N22 6TL 888 3206

MAIL ORDER
DEPT.
No. 11
MAYES RD.
LONDON
N22
6TL

COMPONENTS AND HI FI
FOR THE HOME CONSTRUCTOR
OUR SHOPS ARE OPEN ALL DAY
FROM 9 A.M. TO 6 P.M. 6.30 P.M. ON FRIDAY
(WE CLOSE ALL DAY THURSDAY)
13 SOUTH MALL, EDMONTON, N-9 803 1685



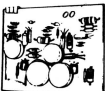
MIDGET FLEX CONNECTOR
Approx. 2 amp rating.
Two-pin non-reversible midget flex connector. Approx. size: 2in. x 1/4in. Ideal for loudspeaker connections, etc. 5p plus 2p P. & P.

MAINS TRANSFORMER
Fused Primary 240V. Secondary 220V @ 50M/A. 6.3V. @ 1A. This transformer is made to a very high standard and is a small size: 2in. x 2 1/2in. x 2 1/2in. 65p plus 15p P. & P.



BARGAIN BOARDS

Components galore for the experimenter
Ex computer boards with:
Resistors,
Capacitors and
Transistors—at least 4 transistors per board.



BARGAIN PRICE 30p per board
5 BOARDS £1.20. P. & P. Free on this item.

HIGH QUALITY IMPORTED HEADPHONES

1,000 Ω per phone... **80p**
2,000 Ω per phone... **80p**
Plus 10p P. & P. per pair.

TTC
G1105



STEREO HEADSET
8 ohm impedance, complete with plug and 5ft lead. A very comfortable phone set. Listen to stereo without noise interrupting the pleasure. Wonderful value. **£2.50** plus 10p P. & P.

SINGLE EARPIECES
Crystal or magnetic plus lead and 3-5 m/m or 2-5 m/m plug. Please state which one required. 10p plus 3p P. & P.

LOW VOLTAGE AMPLIFIER

Few only at **£1.75** plus 13p P. & P.

5 transistor amplifier complete with volume control, is suitable for 9V d.c. and a.c. supplies. Will give about 1W at 8 ohm output. With high IMP input this amplifier will work as a record player, baby alarm, etc. amplifier.



LOUDSPEAKER BARGAINS

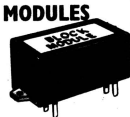
E.M.I. 450 set 3.8, 15 ohm **£3.50** plus 38p. P. & P.
E.M.I. 350 set 8 ohm. **£7.50** plus 38p. P. & P.

MINI LOUDSPEAKERS

2 1/2" 8 ohm **38p** 2 1/2" 25 ohm **38p**
3" 8 ohm **40p** 2 1/2" 75 ohm **38p**
Plus 3p. P. & P. on each Mini Speaker.

SOLID STATE BLOCK MODULES

Phone pre-amp E1311 input 100k gain 28dB max output 3 volt max input 50mV. Tape pre-amp as above E1313. Power amp E1314 input 1.000 ohms gain 20dB 300mW. Organ tone osc E1315 tone freq. 200-1k, Hz output 80mW. All above modules 9 volt. Dual flasher E1318 flash time 1-4 secs power 6 volt. Lamp 6v 150mA. All at **£1.95** P. & P. 10p



D.P.D.T. SLIDE SWITCH

SIZE
1 1/2 ins long 1/2 wide
13p each
3p Postage



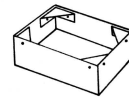
WAFER SWITCHES

1 pole 12 way
2 pole 2 way
2 pole 3 way
2 pole 4 way
2 pole 6 way
3 pole 4 way
4 pole 3 way
22p each. Please inc. 5p P. & P. Up to 3 switches.



ALUMINIUM CHASSIS

Made from 18 gauge aluminium 4 sided chassis with corner brackets. All are 2 1/2" depth.
6 x 3—**41p** 12 x 3—**55p** 14 x 9—**94p**
6 x 4—**45p** 12 x 5—**61p** 16 x 6—**86p**
8 x 6—**53p** 12 x 8—**83p** 16 x 10—**1.08p**
10 x 7—**63p** 14 x 3—**60p**
Please send 10p per chassis P. & P.



CAPACITORS

Mini Electrolytics all values up to 100MFD @ 15V—**7p** each. Small FF Capacitors only in packs of 10 but you can mix values—**25p** for 10.
250MFD @ 25V—**15p**
500MFD @ 25V—**21p**
1000MFD @ 25V—**27p**
2000MFD @ 25V—**34p**
3000MFD @ 25V—**45p**
5000MFD @ 25V—**58p**
Please inc. 10p P. & P. with orders under £2 value.

PRINTED CIRCUIT KIT



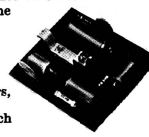
Everything for producing your own printed circuits.
£1.40p plus 10p. P. & P.

PRINTED CIRCUIT BOARD

8 x 6—**10p** 10 x 8—**15p**
9 x 5—**10p** 12 x 12—**30p**
Please inc. 3p. per board P. & P.

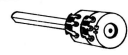
EA1000 3 WATT AUDIO AMPLIFIER MODULE

An Audio Amplifier designed around the TAA621 Linear I.C.:—
Supply Voltage... 9-24V
Speaker Imp... 8-16 ohm
Frequency... 50Hz-26kHz
Overall Size... 2in x 3in x 1/4in
Ideal Amplifier for radios, record players, stereo units, etc.
Full technical data and diagrams with each module. All guaranteed and a bargain at



POTENTIOMETERS

All types 1" and less diameter.
SINGLES DUAL
5K Log or 5K
10K Lin Less 10K
25K Switch 25K
50K 50K
100K **17p** ea, 100K
250K Double 250K
500K Pole 500K
1M Switch 1M
2M **25p** ea, 2M
Up to 3 Pots. Please add 5p. P. & P.



RESISTORS

We stock all recognised values of resistors all at 10% or closer tolerance. We regret we can only mail them in lots of ten. You can send for mixed values.
All Midget types.
1/2 watt lots of 10—**13p**
1 watt lots of 10—**15p**
1 watt lots of 10—**25p**
Please include 3p P. & P. for each 10 resistors.

£2.63 + 5p P. & P.



YOURS FREE FOR 7 DAYS

The 'New Picture-Book' way of learning BASIC ELECTRICITY (5 vols.) BASIC ELECTRONICS (6 vols.)

You'll find it easy to learn with this outstandingly successful NEW PICTORIAL METHOD—the essential facts are explained in the simplest language, one at a time, and each is illustrated by an accurate, cartoon-type drawing. The books are based on

the latest research into simplified learning techniques. This has proved that the PICTORIAL APPROACH to learning is the quickest and soundest way of gaining mastery over these subjects.

TO TRY IT, IS TO PROVE IT

This carefully planned series of manuals has proved a valuable course in training technicians in Electricity, Electronics, Radio and Telecommunications.

WHAT READERS SAY

"'KEY' TO THE KNOWLEDGE"

"Your books have been the key to the knowledge I have needed."
J.M., Horsham.

"UNDERSTAND THE BASIC FACTS"

"This is the first time I have been able to understand the basic facts as all other books are too complicated."
L.W., Sheffield.

"IDEAL TEACHING AGENTS"

"The books are ideal teaching agents. Thank you"
C.J.M., London, S.E.1.

TO THE SELRAY BOOK CO., 60 HAYES HILL, HAYES, BROMLEY, KENT BR2 7HP

Please send me WITHOUT OBLIGATION TO PURCHASE, one of the above sets on 7 DAYS FREE TRIAL. I will either return set, carriage paid, in good condition within 7 days or send the following amounts. BASIC ELECTRICITY £4.50 Cash Price, or Down Payment of £1.00 followed by 4 fortnightly payments of £1.00 each. Total £5.00. BASIC ELECTRONICS £5.40 Cash Price, or Down Payment of £1.00 followed by 5 fortnightly payments £1.00 each. Total £6.00. This offer applies to UNITED KINGDOM ONLY. Overseas customers cash with order, prices as above.

Tick Set required (Only one set allowed on free trial)

BASIC ELECTRICITY ☐ BASIC ELECTRONICS ☐
Prices include Postage and Packing.

Signature _____
(If under 21 signature required of parent or guardian)

NAME _____
BLOCK LETTERS
FULL POSTAL ADDRESS _____

POST NOW FOR THIS OFFER!!

A TECH-PRESS PUBLICATION

BUDGET HIGH-FIDELITY STEREO SYSTEMS



PREMIER STEREO SYSTEM "ONE" Consists of an all transistor stereo amplifier, Garrard 2025 T/C auto manual record player unit fitted stereo mono ceramic cartridge with diamond stylus and mounted in teak finish plinth with perspex cover and two matching teak finish loudspeaker systems. Absolutely complete and supplied ready to plug in and play. 2500 amplifier has an output of 5 watts per channel with inputs for pick-up, tape and tuner also tape output socket. Controls: Bass, Treble, Volume, Balance, Selector, Power on/off. Solid teak cabinet with aluminium front panel. Size 12½" x 4½" x 3½" high (Amplifier available separately if required £14.95 Carr. 40p).

PREMIER STEREO SYSTEM "TWO", as above but with Garrard SP25 MK III—ONLY £47. Carr. £1-75

ONLY
£40-95
carr. £1-75

ONLY
£57-75
carr. £1-75

PREMIER STEREO SYSTEM "THREE" This consists of K LINGER KC903 stereo amplifier giving 6 watts rms per channel with Bass, Treble, Volume and Balance Controls. Inputs for Magnetic and ceramic pickup, tuner, tape in and out. Stereo earphone socket. Garrard SP25 Mk III in teak finish plinth with cover and fitted Sonotone 9TAHCD diamond stereo cartridge. A pair of HMF Speakers size 16½" x 10½" x 9" fitted EMI units complete the matching system.

ONLY £57-75 Carr. £1-75

ALL SYSTEMS SUPPLIED WITH FREE LEADS AND PLUGS

PREMIER HI-FI OFFERS

Amstrad 8000 Stereo Amplifier (List £25-95) **£16-75**
Philips 580 Stereo Amplifier (List £29-00) **£21-00**
Rogers Ravensbrook II Stereo Amplifier in teak case (List £52-50) **£39-50**
Rogers Ravensbourne Stereo Amplifier in teak case (List £64) **£49-00**

NEW LOW COST PREMIER 800 STEREO AMPLIFIER
 5 watts per channel. Ceramic and Magnetic input also tuner and tape inputs and tape outputs.

only £17-25

Metrosound ST20E Stereo Amplifier in teak case (List £39-50) **£28-50**
Golding GL75 less cartridge (List £41-61) **£29-00**
Garrard SP25 III less cartridge **£11-30**
Garrard SP25 III with Goldring G800 cartridge (List £28-35) **£15-50**
Garrard AP76 less cartridge **£19-50**

Garrard 3500 with Sonotone 9TAHC stereo cartridge (List £15-50) **£9-97**

Garrard 2025 T/C with Sonotone 9TAHC Diamond Cartridge **£8-97**
Garrard 2025 T/C with Sonotone 9TAHC Diamond Cartridge ready wired in teak plinth with cover **£14-00**

Carriage and Insurance 50p extra any item.

SP25 MKIII SPECIAL!

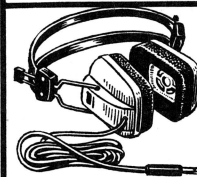


GARRARD SP25 MK III SINGLE RECORD PLAYER FITTED GOLDRING G800 MAGNETIC STEREO CARTRIDGE as available. COMPLETE IN TEAK PLINTH WITH RIGID PERSPEX COVER.

Total list price over £34.

PREMIER PRICE
£18-90

P. & P. 50p.



HI-FI STEREO HEADPHONES

Designed to the highest possible standard. Fitted 2½in. speaker units with soft padded ear muffs. Adjustable headband. 8 ohms impedance. Complete with 6ft lead and stereo jack plug.

£2-47 P. & P. 25p.

STEREO STETHOSCOPE SET Low imp. **£1-25**

P. & P. 10p

MONO STETHOSCOPE SET Low imp. **52p.** P. & P. 10p



E.M.I. 13x8in.

HI-FI SPEAKERS

Fitted two 2½in tweeters and crossover network. Impedance 8 or 15 ohm. Handling capacity 10W. Brand new.

£3-47 P. & P. 40p



WELLER "EXPERT" SOLDER GUN. Saves time and simplifies soldering in the home and service dept. Two position trigger gives instant dual heat. 100/140 P. & P. watt. 240 volt A.C. **£4-25** 30p



"Marksman" Soldering Iron. Lightweight ¼" pencil bit. Ideal for regular bench use and around the home. 25 watts. 240 volt A.C. **£1-50** P. & P. 15p

VERITAS V-149 MIXER

Battery operated 4-channel audio mixer providing four separate inputs. Size 6x3x2in. suitable for crystal microphone low impedance microphone, with transformer, radio, tape, etc. Max. input 1.5v. Max. output 2.5v. Gain 6 dB. Standard jack plug socket inputs, phono plugs output. Attractive teak wood grain finish case.

MONO MODEL **£3**

STEREO MODEL **£3-47**

P. & P. 12p



TAPE CASSETTES

C60 (60 min.) 37p 3 for **£1-05**
C90 (90 min.) 62p 3 for **£1-80**
C120 (120 min.) 87p 3 for **£2-55**

P. & P. 5p.

FREE CASSETTE HEAD CLEANER with every 10 cassettes purchased.

All cassettes can be supplied with library cases at 3p. extra each

"VERITONE" RECORDING TAPE

SPECIALLY MANUFACTURED IN U.S.A. FROM EXTRA STRONG PRE-STRETCHED MATERIAL. THE QUALITY IS UNEQUALLED. TENSILISED to ensure the most permanent base. Highly resistant to breakage, moisture, heat, cold or humidity. High polished splice free finish. Smooth output throughout the entire audio range. Double wrapped—attractively boxed.

LP3 3" 250' P.V.C.	28p	DT6 5½" 1800' POLYESTER	£1-12
TT3 3" 450' POLYESTER	37p	TT6 5½" 2400' POLYESTER	£1-87
DT3 3½" 600' POLYESTER	57p	SP7 7" 1200' P.V.C.	62p
SP5 5" 600' P.V.C.	42p	LF7 7" 1800' P.V.C.	75p
LP5 5" 900' P.V.C.	50p	DT7 7" 2400' POLYESTER	£1-25
DT5 5" 1200' POLYESTER	75p	TT7 7" 3600' POLYESTER	£2-50
LP6 5½" 1200' P.V.C.	75p		

TAPE SPOOLS 3" 5p, 5", 5½", 7", 7p.
 Post and Packing 3" 5p, 5", 5½", 8p, 7" 10p (3 reels and over Post Free).



PREMIER RADIO

10 & 23, TOTTENHAM COURT ROAD, LONDON, W.1 TEL: 01-636 3451/2639
 HEAD OFFICE & MAIL ORDER DEPT. 23, TOTTENHAM CT. RD. TEL: 01-636 3451



G. F. MILWARD 369 Alum Rock Road, Birmingham B8 3DR. Tel. 021-327 2339

SPECIAL 50p PACKS. ORDER 10 PACKS AND WE WILL INCLUDE AN EXTRA ONE FREE !!!

RESISTORS, 1/2 watt	100	50p
assorted		
Wire-wound 1 to 3 watt	20	50p
5 to 7 watt	15	50p
10 watts	10	50p
Multi-tapped	12	50p
PAPER CONDENSERS		
TV types	50	50p
Miniature	100	50p
ELECTROLYTIC CONDENSERS		
Suitable for Mains		
Radio/TV	10	50p
Transistor types	20	50p
Mixed (both types)	15	50p
POLYSTYRENE CONDENSERS	100	50p
MULLARD POLYESTER		
COND.	50	50p
SILVER MICA	100	50p
WIRE-WOUND 3-Watt		
SLIDERS	15	50p
VOLUME CONTROLS		
Assorted	5	50p
NUTS AND BOLTS. Mixed		
length/type		
8 B.A.	100	50p
6 B.A.	100	50p
4 B.A.	100	50p
2 B.A.	100	50p
METAL SPEAKER GRILLES		
7 1/2 in. x 3 1/2 in.	6	50p
EARPIECES, MAGNETIC		
No Plug	6	50p
2.5mm Plug	4	50p
3.5mm Plug	4	50p
500 MICRO-AMP LEVEL		
METERS	1	50p
VEROBOARD, TRIAL PACK		
5 BOARDS + CUTTER	50p	

TRANSISTORS		
P.N.P. Untested but mainly	50	50p
O.K.		
N.P.N. Untested but mainly	50	50p
O.K.		
OCF 71 equivalent	5	50p
Light-sensitive Diodes	10	50p
(These produce up to 1ma from light)		
OC44 Mullard 1st grade	4	50p
OC45 Mullard Boxed	5	50p
2G378 Output, Marked	5	50p
2G371 Driver, Marked	5	50p
ASY 22, Marked	5	50p
BY 127 Rectifiers	4	50p
IN4007 Rectifiers	4	50p
(1200V peak)		
STC 3/4 Rectifiers	6	50p
DIODES (OA 81 & OA 91)	40	50p
WIRE		
Solid Core. Insul. 100yds.	50p	
Stranded ditto 50yds.	50p	
SOLAR CELLS		
Large Selenium	2	50p
Small	3	50p
(6 cells will power a Micro-matic radio)		
CO-AXIAL CABLE		
Semi Air-spaced 15yds.	50p	
CRYSTAL TAPE RECORDER		
MIKES	1	50p
CRYSTAL EARPIECES		
3.5mm Plug	2	50p
TRANSISTORISED Signal		
Injector Kit	1	50p
TRANSISTORISED Signal		
Tracer Kit	1	50p
TRANSISTORISED CAR REV.		
COUNTER KIT (Needs 1 ma. meter as indicator)	1	50p

Unrepeatable Offer ! ! ! !
Surplus VEROBOARDS, 3 1/2" x 2 1/2" x .15"
Only 10p each or £1.00 per dozen

TANTALUM CAPACITORS. COMPARE THE PRICE—ONLY 10p EACH ! ! ! !

Sub-miniature types	Miniature types				
0.047µF 50 volts	0.022µF 20 volts	5	6 µF	35	volts
0.056µF 50 volts	0.033µF 20 volts	8	2 µF	10	volts
0.07 µF 20 volts	0.047µF 20 volts	15	1 µF	35	volts
0.1 µF 20 volts	0.068µF 35 volts	18	1 µF	35	volts
0.1 µF 50 volts	0.12 µF 35 volts	22	1 µF	15	volts
0.18 µF 20 volts	0.15 µF 35 volts	27	1 µF	120	volts
0.33 µF 35 volts	0.22 µF 50 volts	56	1 µF	15	volts
0.47 µF 35 volts	0.47 µF 50 volts	56	1 µF	20	volts
0.68 µF 20 volts	0.68 µF 35 volts	150	1 µF	6	volts
1.0 µF 15 volts	0.68 µF 50 volts				
2.2 µF 3 volts	1.0 µF 35 volts	Standard			
2.7 µF 15 volts	1.0 µF 75 volts	6	8 µF	50	volts
2.7 µF 35 volts	1.8 µF 20 volts	7	5 µF	20	volts
3.0 µF 12 volts	2.2 µF 20 volts	8	2 µF	150	volts
10.0 µF 1.5 volts	2.7 µF 50 volts	12	1 µF	35	volts
	3	12	12	50	volts
	3.3	15	39	20	volts
	4	20	82	20	volts
	4.7	35	150	15	volts
	5.6	6	270	6	volts

NEW ! NEW ! NEW ! NEW !

An aerosol spray providing a convenient means of producing any number of copies of a printed circuit both simply and quickly.

Method: Spray copper laminate board with light-sensitive spray. Cover with transparent film upon which circuit has been drawn. Expose to light. (No need to use ultra-violet.) Spray with developer, rinse and etch in normal manner.

Light sensitive aerosol spray £1
 Developer spray 50p

STOCKTAKING CLEARANCE! IMPOSSIBLE TO REPEAT!
 We have huge numbers of components in quantities too small to advertise individually. In order to "clear the decks" we have made up parcels containing a mixture of carbon and wire-wound resistors, electrolytic and paper condensers, controls, transistors, diodes etc., for a tiny fraction of normal price. It is emphasised that these are mixed parcels only—contents cannot be stipulated! Sold only by weight.

Gross weight 2 lb. £1 (postage 20p)
 Gross weight 5 lb. £2 (postage 30p)

G. F. MILWARD, Drayton Bassett, Tamworth, Staffs. Postage (minimum) per order 15p.

WELCOME NEW READER ! !

For those of you who haven't heard of LST:—

LST are one of the oldest companies in Electronics Mail Order.

LST have a reputation for quality and service second to none.

LST stock only top quality components from the biggest names in Electronics.

LST's prices are the lowest possible commensurate with quality.

LST's 44 page catalogue is available FREE, the only Company to our knowledge making this offer!



SPECIAL EXPERIMENTORS BARGAIN PACK OFFER!

To introduce the new reader to electronics—a fascinating hobby—LST are offering for a limited period only a special package deal containing common transistors & diodes, common values of resistors and capacitors, solder, circuit board, and other useful brand name components at the special bargain price of £2—Our normal catalogue price over £4!!! Just place a tick in the box—tear out coupon, fill in your name and address, LST will ship your catalogue (free) or your bargain pack (£2) by return.

£2

CUT OUT THIS COUPON →

**LST ELECTRONIC
 COMPONENTS LTD.,
 DEPT. E.E.,
 7 COPTFOLD ROAD,
 BRENTWOOD,
 ESSEX.**

FROM:—

.....NAME

.....ADDRESS

I ENCLOSE £2
 FOR YOUR
 "BARGAIN
 PACK" OFFER



TICK BOX

SEND YOUR
 FREE
 CATALOGUE



TICK BOX

**STOCKISTS-DISTRIBUTORS OF: IR, WELPER,
 MULLARD, NEWMARKET, SIEMENS, RCA, ISKRA
 VEROBOARD, S-DECS, TEXAS, G.E., MOTOROLA.**

PLEASE PRINT CLEARLY

9 Vol Gramophone Unit. Collaro battery operated with pick up on unit plate. 4 speed auto-stop turnover cartridge. Price **£25.50** plus 40p post and insurance.

Buy Time Slot Meter. Made by Sangamo Weston. 3 types—one for each coin, 21p, 5p or 10p. Price **£1.75** each plus 25p post and insurance.

Photo Electric Kit. Contains photo cell, relay, transistor and all parts to make light operated switch. Originally £2. Limited quantity to clear. **£1.25** plus 20p post and insurance.

Desk/Hand Mike. Made by Acos. Crystal insert in neat plastic case which opens at right angles for desk or opens completely for hand holding. Good general purpose mike. Price **85p** each.

Printed Circuit Kits. Hagato Pk. 3 facilities in kit form include printing, etching, resist, etching, polishing and complete manufacture of printed sets to own specifications. Price **£1.25** + 20p.

DEMO DECK

as described last month
£6 post free

Laboratory Instruments. For horizontal use in strong black reinforced bakelite cases with screw down terminals especially suitable for experiments and demonstrations. All have precision meters (manufacturers quoted accuracy of better than 1-5%). Following available:

D.C. Voltmeter 0-300v. f.s.d. moving coil mirror scale meter size approx. $5 \times 4\frac{1}{2} \times 1\frac{1}{2}$ in. Price **£1.75**.

D.C. Voltmeter 0-30v. f.s.d. moving coil mirror scale meter. Size approx. $5 \times 4\frac{1}{2} \times 1\frac{1}{2}$ in. Price **£1.75**.

AC/DC Milliammeters 3 range, moving mirror scale meter. Range selection 25, 50 and 100mA by selection switch mirror scale (coil resistance marked) size, $7\frac{1}{2} \times 5 \times 3\frac{1}{2}$ in. type 35999/1. Price **£3.75**.

Micrommeter 100 micro amps f.s.d., moving coil mirror scale precision meter (coil resistance marked) size, $5 \times 4\frac{1}{2} \times 2\frac{1}{2}$ in. type M/109/1. Price **£3**.

Galvanometer 20-0-20 f.s.d. moving coil precision laboratory instrument of extremely high sensitivity (3×10^{-7} A per division). Size approx. $6\frac{1}{2} \times 3\frac{1}{2} \times 2\frac{1}{2}$ in. Price **£5**.

Parmeko Neptune Series C. Core Transformers. These transformers are beautifully made, steel encased, stove enamelled black, upright mounting. All have normal 50cps. primary 230/240v. with primary screen and are new and unused. Small quantities only of each type available as follows:

Model 6000/79. 275-0-275v. at 330mA, and 6-3v. at 4-6a. Price **£4.50**, + 50p post.

Model 6000/71.290-215-0-215-290 at 125mA, and 2 at 6-3v. 6a. Price **£4.50** + 40p post.

Model 49. 250v. 10mA, 6-3v. at 3a., 5v. at 0.75a. Price **£2** + 30p post.

Model 47. 620-0-620 at 9mA. 4v. at 1A. Price **£4.50** + 40p post.

Parmeko Neptune C. Core Chokes. These are encased and match the transformers above.

Model 6000/73 4H at 560mA. **£2.50** + 40p post.

Model 55. 10H at 1mA. **£2.50** + 40p post.

Model 49. 10H at 70mA. **£2.50** + 30p post.

Model 69. 10H at 110mA. Price **£2** + 40p post.

Fuse Holders. Heavy duty type B.S.S. 88 440. Reyrolle power fuse holders. English Electric type S.100.1, ex. equipment. Price **50p**.

Fuses. H.R.C. 10A, 160A type E.A. Eng. Electric 100A, 160A, type 54TF Kantark 60 A., new, all at **25p** each.

Electronic Car Ignition. In addition to the kits for 12v. cars we can also supply systems for 6v. cars. These are not kits but made up and ready to work. Price **£5.50** + 30p post.

Carbon Resistors. We are now stocking these in a big way and will be pleased to quote special prices to quantity buyers. Made by Erie, Morganite or Dubillar.

	Price each
1-9	10-99
1 watt	1p
2 watt	2p
5 watt	5p
10 watt	10p
20 watt	20p
50 watt	50p
100 watt	100p
200 watt	200p
500 watt	500p
1000 watt	1000p

Special Resistor Assortment Offer (1). 100 x watt resistors made up of 2 each of 50 different values fairly evenly spaced between 1 ohm and 10 meg. Price **50p**.

Special Resistor Assortment Offer (2). 1,000 x $\frac{1}{2}$ watt resistors made up of 20 each of 50 different values fairly evenly spaced between 1 ohm and 20 meg. Price **£4**.

Special Resistor Assortment Offer (3). As offer 1 but 1 watt. Price **£1**.

Special Resistor Assortment Offer (4). As offer 2 but 1 watt. Price **£8**.

12 Way Sub-Miniature Multi-core Cable 7-0076 copper cores, each core P.V.C. insulated and of different colour. P.V.C. covered overall and approx. $\frac{1}{8}$ in. thick. Price **20p** per yard.

DRILL CONTROLLER

NEW IKW MODEL

Electronically changes speed from approximately 10 revs. to maximum. Full power at all speeds by finger-tip control. Kit includes all parts, case, everything and full instructions. **£1.50** plus 13p post and insurance. Made up model also available. **£2.25** plus 13p post and p.



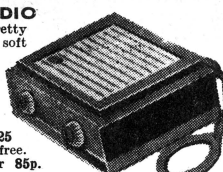
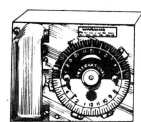
Neon Indicator Lamps. With amber lens, standard type with built in resistor for mains. 10p each, 10 for 90p.

Condensers. Another addition to our range. 500µF at 50v. 15p each, 10 for **£1.25**.

MICROSONIC KEY CHAIN RADIO

7 transistor Keychain Radio in very pretty case, size $2\frac{1}{2} \times 2\frac{1}{2} \times 1\frac{1}{2}$ in.—complete with soft leather zippered bag. 7 transistor, ferrite rod, loudspeaker.

In transit from the East these sets suffered corrosion as the batteries were left in them but when this corrosion is cleared away they should work—offered without guarantee except that they are new. Price only **£1.25** less batteries plus 13p post. 6 for **£7** post free. Pair of rechargeable batteries and charger **85p**.



24-HOUR TIME SWITCH

Made by Smiths, these are AC mains operated. NOT CLOCKWORK. Ideal for mounting on rack or shelf or can be built into box with 15A socket. 2 completely adjustable time periods per 24 hours, 5 amp changeover contacts will switch circuit on or off during these periods. **£2.50** post and ins. 23p. Additional time contacts **50p** pair.

THE FULL-FI STEREO SIX



The amplifier

You will be amazed at the sensation of the year fullness of reproduction and at the added qualities your records or tuner will reproduce. Built into metal cabinet elegantly styled in simulated teak finished

to blend with modern furnishings, this amplifier uses an integrated solid state circuit with an output power of 6 watts R.M.S. split over the two channels. The amplifier is ideal for use with normal pick-ups and tuners, it has a double wound mains transformer and ganged volume and tone controls—also switching for Mono to Stereo, tuner or pick-up. Other controls include "treble lift and cut", "balance" and separate mains on/off switch. **UNREPEATABLE PRICE** is **£9** plus 38p post and insurance.

THIS MONTHS SNIP

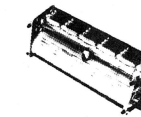
POCKET CIRCUIT TESTER

Test continuity of any low resistance circuit, house wiring, car electronics. Tests polarity of diodes and rectifiers. Also ideal size for conversion to signal injector (circuit supplied). **30p** or 2 for **50p** post paid.



TANGENTIAL HEATER UNITS

This heater unit is the very latest type, most efficient, and quiet running. Is as fitted in Hoover and blower heaters costing £15 and more. We have a few only. Comprises motor, impeller, 2kW element and 1kW element allowing switching 1, 2 and 3kW and with thermal safety cut-out. Can be fitted into any metal line case or cabinet. Only need control switch. **£3.50**, 2kW Model as above except 2 kilowatts **£2.50**. Don't miss this. Control Switch **35p**, P. & P. 40p.



LAST MONTH'S FEATURES

Kits of parts available as follows:—

HOME SENTINEL INTRUDER ALARM

Complete kit, with case **£3.75**.

SNAP INDICATOR

All components but not case or battery **75p**.

WINDSCREEN WIPER CONTROL

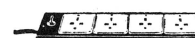
All components including metal for chassis **£1.50**.

RECORD PLAYER

All components, but not case, loudspeaker, record deck or pick-up **£5-15**

DISTRIBUTION PANELS

Just what you need for work bench or lab. 4 x 13 amp sockets in metal box to take standard 13 amp fused plugs and on/off switch with neon warning light. Supplied complete with 7 feet of heavy cable. Wired up ready to work, **£2** less plug **£2.25** with fitted 13 amp plug; **£2.40** with fitted 15 amp plug, plus **25p** P. & I.



CAPACITOR DISCHARGE CAR IGNITION

This system which has proved to be amazingly efficient and reliable was first described in the Wireless World about a year ago. We can supply kit of parts for improved and even more efficient version (P.W. June), price **£4.95**. When ordering please state whether for positive or negative systems. Plus **30p** post.



15 WATT 12in HI-FI SPEAKER

Is undoubtedly one

of the finest loudspeakers that we have ever offered, produced by one of the country's most famous makers. It has a die-cast metal frame and is strongly recommended for Hi-Fi and public address. Handling 15W R.M.S.—Cone moulded fibre—Freq. response 30-10,000 c.p.s.—specify 3 or 15 ohms. Chassis diam. 12in.—12 $\frac{1}{2}$ in. over mounting lugs. Overall height 5 $\frac{1}{2}$ in. A £10 speaker offered this month for **£3.75** plus 30p post and insurance.



Where postage is not stated then orders over **£5** are post free. Below **£5** add **20p**. Semi-conductors add **5p** post. Over **£1** post free. S.A.E. with enquiries please.

FUZZ BOX

and colour temperature meter featured in this issue. To receive these kits quickly, send quoted approx price and any change due will be refunded.

Commutator Motor. Small, size approx. 3 in. plus 1 in. of shaft. 3 in. high x $1\frac{1}{2}$ in. wide, but high speed and very powerful. These motors operate from the mains. Are particularly useful as they can be speed controlled by our thyristor kit or by variable resistor. **£1** each.

Auto Light Kit. The circuit for this appeared in *Practical Wireless*, October issue. It is a simple circuit but has many uses: Parking light, porch light, etc. Uses light cell and two transistors. Complete kit, no case **95p**. Suitable case **20p**.

Charger Kit. Comprises of a 3 amp. transformer, 5 amp. rectifier and a pair of hefty crocodile clips. With wiring diagram. **£1.40** plus 20p post and insurance.

SPARTAN PORTABLE RADIO

Long and medium wave, 7 transistor, size 6in. x 4in. x $1\frac{1}{2}$ in. with larger than usual speaker giving very good tone. Built-in ferrite aerial and telescopic aerial for distant stations. A real bargain complete with leather case, carrying sling, earplug and case **£3.75** plus 25p post and ins.



Thermistor Bead Type. For instruments, medical applications, etc. 1TT No. GL23. **75p** each. 10 for **£6.75**.

3 Core Mains Leads. Special offer this month is a 6ft. lead with 23/36 cores and coloured according to the new code i.e. Brown—live; Yellow/Green—earth; Blue—neutral. Price **6p** each or 10 for **50p**.

Integrated Circuit Mountings. Enables 1.C.'s to be plugged in and out for quick substitution and to prevent damage to soldering. 14 pin type **14p** each or 10 for **£1.26**. 16 pin type **16p** each or 10 for **£1.44**. Note these are suitable for use with printed circuit or vero boards.

Plain Paxolin Panels. Medium thickness. Ideal for fronts and for transistor projects generally.

Size	1	10	Size	1	10
6 x 2	6p	54p	6 x 6	18p	£1.62
12 x 2	12p	£1.08	12 x 6	30p	£2.70
6 x 4	12p	£1.08	6 x 8	21p	£1.89
12 x 2	14p	£1.26	12 x 8	40p	£3.60
6 x 4	12p	£1.08	12 x 12	60p	£5.40
12 x 4	24p	£2.16	24 x 12	£1.00	£9.00

70 THINGS YOU CAN MAKE

Send S.A.E. today for list of 70 constructor projects — instruments — alarms — counters — locks — radios, etc., etc.

0-8 AMMETER

2 in. square full vision face for flush mounting. Moving iron instrument. Ideal for charger. Price **45p** each. 10 for **£3.80**.



PAPST MINIATURE EXTRACTOR FANS

Beautifully made as are all Papst motors. Intended for cooling computers but suitable for any equipment. Size 4 $\frac{1}{2}$ in. square and $1\frac{1}{2}$ in. thick. Price **£2** each. Post and insurance **20p**.



24hr CLOCK SWITCH

In metal case with 13 amp. socket. Smiths movement, 2 on 2 and 2 off per 24 hours. Very neatly made and finished. Original retail price **£7** each. Few only, new and perfect. **£4.00** each.



NUMICATOR TUBES

For digital instruments, counters, timers, clocks, etc. Hi-vac XN. 3. Price **£1.45** each. 10 for **£13**.



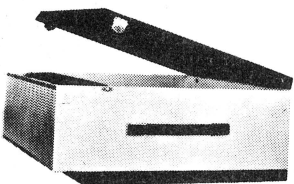
SNAP ACTION SLIDE SWITCH

Rated 5a. 240v. Made by Arrow. Type fitted in the handles of electric drills, vacuums, etc. **5p** each. 10 for **45p**.



J. BULL (ELECTRICAL) LTD.
(Dept. E.E.) 7 Park Street, Croydon CRO 1YD

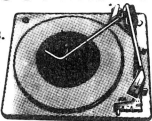
PHILIPS PORTABLE PLAYER CABINET



Size 18 x 15 1/2 x 7 1/2 in. Cut for B.S.R. UA12/14/15/16/25 deck. Amplifier space 14 x 5 x 3 in. Satin aluminium front grille. Really smart appearance. £4 Post 25p Black/White. Chrome fittings.

BSR C.109 SUPERSLIM STEREO AND MONO

Plays 12", 10" or 7" records. Auto or Manual. A high quality unit backed by BSR reliability with 12 months' guarantee. AC 200/250v. Size 13 1/2 x 11 1/2 in. Above motor board 3 1/2 in. below motor board 2 1/2 in. with STEREO and MONO XTAL £7.75 Post 25p



GARRARD SINGLE PLAY TA Mk II Stereo/Mono £10
GARRARD PLAYERS with Sonotone GTA Cartridges. Stereo Diamond and Mono Sapphire. SP25 Mk II £15
Model 2500 Stereo and Mono Autochanger £14. Post 25p.

RECORD PLAYER PORTABLE CABINET £3.75

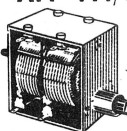
With space for R.C.S. Amplifiers and most modern autochangers. Two-tone rexine covered. Post 25p
RCS DE-LUXE 3 WATT AMPLIFIER. Ready made with 2-stage triode pentode valve, 3 watts output. Tone and volume controls. Isolated mains transformer, knobs, loudspeaker valves ECL82, E290. Response 50-12,000 cps. Sensitivity 200mV. Post 25p. £4

R.C.S. TEAKWOOD BASE. Ready cut out for mounting (State player make and model) £2.75

R.C.S. PLASTIC COVERS FOR ABOVE BASE. £2.75
Durable tinted plastic, attractive appearance.

EMI PICK-UP ARM with mono xtal and stylus £1.25
H.F.I. PICK-UP CARTRIDGES. Diamond Stereo/Mono. GTA £2.50; GP84 £2.50; GP83 £2.00; Mono GP81 £1.50; GC8 £1.25; ACOS L.P. only 50p.

AM-FM/VHF TUNING GANG



Super quality small size 1 1/2 x 1 1/2 in. plus spindle 1 1/2 x 1/2 in. 365 + 365 pF with 25 + 25 pF. British made. Geared slow motion drive 6:1. Plastic dust cover. 6BA tapped front fixing. Cast aluminium frame 50p Post Free

WEYRAD P50-TRANSISTOR COILS

RA2W Ferrite Aerial... 65p	Spare Cores... 3p
Osc. P50/1AC... 30p	Driver Trans. LFDT4... 50p
I.F. P50/2CC 470 kc/s... 33p	Printed Circuit, PCA1... 50p
3rd I.F. P50/3CC... 33p	J.F.T. Tuning Gang... 65p
50/3 or P51/2... 33p	Weyrad Booklet... 10p
P50/3V... 33p	O.P.T. Transistor... 55p

Mullard Ferrite Rod 8 x 1/2 in. 20p, 6 x 1/2 in. 25p.

VOLUME CONTROLS
Long spindles. Midget Size 5 K. ohms to 2 Meg. LOG or LIN. L/S 15p. D.P. 25p. STEREO L/S 55p. D.P. 75p. Edge 5K. S.P. Transistor 25p

200ohm Coax 4p. yd.
BRITISH AERIALITE
AERIAL-ALR SPACED
40 yd. £1.40; 60 yd. £2.
FRINGE LOW LOSS 10p yd.
Ideal 625 and colour.

WIRE-WOUND 3-WATT POTS.
Small type with small knob. Values 10 Ω to 30 K. 25p

WIRE-WOUND 3-WATT STANDARD SIZE POTS.
LONG SPINDLE 10 OHMS to 100 K. 40p

VEROBORD 0.15 MATRIX
2 1/2 x 5 in. 19p. 2 1/2 x 3 1/2 in. 16p. 3 1/2 x 3 1/2 in. 19p. 3 1/2 x 5 in. 26p.
EDGE CONNECTORS 16 way 25p; 24 way 38p.
PINS 36 per packet 17p. FACE CUTTERS 38p.
S.R.B.P. Board 0.15 MATRIX 2 1/2 in. wide 3p per lin., 3 1/2 in. wide 4p per 1 in.; 5 in. side 5p per lin. (up to 17 in.).
S.R.B.P. undrilled 1/2 in. Board 10 x 5 in. 15p.

BLANK ALUMINIUM CHASSIS. 18 s.w.g. 2 1/2 in. sides. 6 x 4 in. 45p; 8 x 6 in. 50p; 10 x 7 in. 70p; 14 x 9 in. 90p; 16 x 6 in. 90p; 12 x 3 in. 50p.
ALUMINIUM PANELS 18 s.w.g. 6 x 4 in. 8p; 8 x 6 in. 15p; 10 x 7 in. 17p; 12 x 8 in. 23p; 14 x 9 in. 27p; 12 x 12 in. 35p.

1 1/2 in DIAMETER WAVE-CHANGING SWITCHES 25p.
2 p. 2-way, or 2 p. 6-way or 3 p. 4-way 25p each. 1 p. 12-way, or 4 p. 2-way, or 4 p. 3-way 25p.
1 inch DIAMETER Wavechange "MAKITS" 1 p. 12-way, 2 p. 6-way, 3 p. 4-way, 4 p. 3-way, 6 p. 2-way, 1 water 60p, 2 water 90p. Extra waters up to six 30p each.
TOGGLE SWITCHES, sp. 14p; dp. 18p; dp. dt. 25p.

"THE INSTANT" BULK TAPE ERASER AND RECORDING HEAD DEMAGNETISER



200/250 v. A.C. Leaflet S.A.E. £2.35 Post 15p

Minimum Post and Packing 15p

RETURN OF POST DESPATCH.

HI-FI STOCKISTS.

CUSTOMERS FREE CAR PARK.

CALLERS WELCOME

RADIO COMPONENT SPECIALISTS

List 5p. Written guarantee with every purchase. (Export: Remit cash and extra postage.) Buses 133, 68 pass door. S.R. Stn. Selhurst. Tel. 01-684-1665

R.C.S. STABILISED POWER PACK KIT

All parts and instructions with Zener Diode, Printed Circuit, Bridge Rectifiers and Double Wound Mains Transformer input 200/240v. AC. Output voltages available 6 or 9 or 12 or 15 or 18 or 20v. DC at 100mA or less. PLEASE STATE VOLTAGE REQUIRED. £2 POST FREE Details S.A.E.

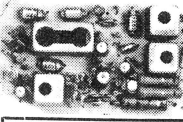
GENERAL PURPOSE TRANSISTOR PRE-AMPLIFIER BRITISH MADE

for Mike, Tape, P.U., Guitar, etc.
Battery 9-12v or H.T. line 200-300v D.C. operation. Size 1 1/2 x 1 1/2 x 1". Response 25 c.p.s. to 25 Kc/s. 26db gain. For use with valve or transistor equipment. Full instructions supplied. Brand new. Guaranteed. Details S.A.E. 90p Post 10p

NEW TUBULAR ELECTROLYTICS		CAN TYPES	
2/350V... 14p	250/25V... 14p	18-18/500V... 55p	
4/350V... 14p	500/25V... 20p	50-50/350V... 35p	
8/450V... 14p	1000/25V... 35p	60-100/350V... 58p	
16/450V... 14p	1000/50V... 47p	32-32/250V... 18p	
32/450V... 20p	8-8/450V... 18p	32-32/450V... 33p	
25/25V... 10p	8-16/450V... 20p	350-50/325V... 50p	
50/50V... 10p	16-16/450V... 25p	32-32-32/350V... 45p	
100/25V... 10p	32-32/350V... 25p	100-50-50/350V... 48p	

SUB-MIN. ELECTROLYTICS. 1, 2, 4, 5, 8, 16, 25, 30, 50, 100, 200mF 15V 10p; 500, 1000mF 15V 12p; 2000mF 25V 35p.
CERAMIC 1pF to 0.01 mF, 4p. Silver Mica 2 to 5000pF, 4p.
PAPER 350V-0.1 4p, 0.5 18p; 1mF 15p; 2mF 150V 15p.
500V-0.001 to 0.05 4p; 0.1 5p; 0.25 5p; 0.47 25p.
SILVER MICA. Close tolerance. 1/2, 2-2-500pF 5p; 500-2-200 pF 10p; 2-700-5-600pF 5p; 5-100pF 5p; 100pF 15p.
TWIN GANG. "0-0" 208pF + 176pF, 65p; Slow motion drive 365 + 365 with 25 + 25pF, 50p. 50pF slow motion, standard 45p; small 3-gang 500pF £1.10. **SHORT WAVE.** Single 25pF 55p
CHROME TELESCOPIC AERIAL, swivel base, 23in. 20p.
TUNING. Solid dielectric. 100pF. 500pF. 35p each.
TRIMMERS. Compression. 20pF 10p; 50pF 10p; 150pF 15p.
8p; 250pF 10p; 600pF 10p; 750pF 10p; 1250pF 10p.
SILICON REC. 40- LUCAS 2DS500 Bridge 70V 5 amp £1
RECTIFIERS CONTACT COOLED 1 wave 60mA 38p; 85mA 48p. **SILICON BVY1330p; BV100 30p; BV127 30p.**
EX-GOVERNMENT RECTIFIERS 250v, 200mA, 30p.
NEON PANEL INDICATORS 250V AC/DC Red or Amber 20p.
RESISTORS. 1/4 W., 20% 12p; 1/2 W., 20% 15p.
HIGH STABILITY. 1/4 W., 2% 10 ohms to 1 meg., 10p.
Ditto 5%. Preferred values 10 ohms to 10 meg., 10p.
WIRE-WOUND RESISTORS 5 watt, 10 watt, 15 watt, 10 ohms to 100K, 10p each; 21 watt, 1 ohm to 8-2 ohms 10p

PHILIPS TRANSISTOR FM STEREO



MULTIPLIER DECODER.
As used in LEAK Troughline Tuner. Brand New. Pre-aligned with 9 semi-conductors. 24v. DC at 6mA. Complete with circuit and connection details. £4 FREE 3 1/2 x 2 x 1 in.

MAINS TRANSFORMERS

	ALL POST 25p each
250-0-250 80 mA. 6.3 v. 4 amp.	£1.40
250-0-250 80 mA. 6.3 v. 3.5 a. 6.3 v. 1 a. or 5 v. 2 a.	£2.00
350-0-350 80 mA. 6.3 v. 3.5 a. 6.3 v. 1 a. or 5 v. 2 a.	£2.00
300-0-300 v. 120 mA. 6.3 v. 4 a. C.T. 6.3 v. 2 a.	£2.50
MINIATURE 200 v. 20 mA. 6.3 v. 1 a. 2 1/2 x 2 1/2 in.	75p
MIDGET 220 v. 45 mA. 6.3 v. 3 v. 2 a. 2 1/2 x 2 1/2 in.	90p
P.E. AUBORA TRANS. 12 + 12v. 500mA.	£1.50
MINI-MAINS 220v. 100mA. 1 1/2 x 1 1/2 x 1 1/2 in.	50p
HEATER TRANS. 6.3v. 3 a.	60p
Ditto tapped sec. 1.4 v., 2.3 v., 4 v., 6.3 v. 1 1/2 amp.	80p
GENERAL PURPOSE LOW VOLTAGE. Tapped outputs. 2 amp. 3, 4, 5, 6, 8, 9, 10, 12, 15, 18, 24 and 30 v. 200 v. 1 amp. 6, 8, 10, 12, 15, 18, 20, 24, 30, 36, 40, 48, 60, £2.00	
2 amp. 6, 8, 10, 12, 15, 18, 20, 24, 30, 36, 40, 48, 60, £2.00	
AUTO TRANSFORMERS 115v. to 230v., or 230v. to 115v. Input/Output. 150w. £2.00; 500w. £5; 1000w. £12.	
CHARGER TRANSFORMERS. Input 200/250v. for 6 or 12v. 1 amp. £1.20; 2 amp. £1.50; 4 amp. £2.00.	
FULL WAVE BRIDGE CHARGER RECTIFIERS. 6 or 12 v. outputs. 1 amp. 40p; 2 amp. 55p; 4 amp. 85p.	

All transformers Postage 25p extra.

E.M.I. 1 1/2 x 8 in. LOUSPEAKERS



With twin tweeters and crossover, 10 watt. State 3 or 8 or 15 ohm. (As illustrated) Post 15p
With flared tweeter cone and ceramic magnet. 10 watts. Bass res. 45-60 cps. Flux 10,000 gauss. Recommended 3 or 8 or 15 ohm. Post 15p

Standard Tech Cabinet Size 16 x 10 x 9 in. Post 25p £5

10W MINI-MODULE LOUSPEAKER KIT £3.25

Post 25p
Triple speaker system combining on ready cut baffle. 1/2 in. chipboard 15 in. x 8 1/2 in. Separate Bass, Middle and Treble loudspeakers and crossover condenser. The heavy duty 5 in. Bass Woofer unit has a low resonance cone. The mid-range unit is specially designed to add drive to the middle register and the tweeter recreates the top end of the musical spectrum. Total response 20-15,000 cps. Full instructions for 3 or 15 ohm.
TEAK VENEERED BOOKSHELF ENCLOSURE. 16 1/2 x 10 1/2 x 6 in. Modern Design, dark grey Tygan covered baffle £5 Post 25p

ALL MODELS "BAKER SPEAKERS" IN STOCK

BAKER 12in. MAJOR £9



30-14,500 c.p.s., 12in. double cone, woofer and tweeter cone together with a BAKER ceramic magnet assembly having a flux density of 14,000 gauss and a total flux of 145,000 Maxwells. Bass resonance 40 c.p.s. Rated 20 watts. Voice coils 3 or 8 or 15 ohms. Post Free
Module kit, 30-17,000 c.p.s. with tweeter, crossover, baffle and instructions. £11.50

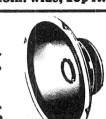
BAKER "BIG-SOUND" SPEAKERS

'Group 25'	'Group 35'	'Group 50'
12 inch £7	12 inch £9	15 inch £19
25 watt	35 watt	50 watt
3 or 8 or 15 ohm	3 or 8 or 15 ohm	8 or 15 ohm

TEAK HI-FI SPEAKER CABINETS. Fluted wood front For 12in. round Loudspeaker £9. Post 25p For 13 x 8in. Loudspeaker £9. Post 25p For 10 x 6in. round Loudspeaker £9. Post 25p
LOUDSPEAKER CABINET WADDING 18in. wide, 15p. It.

GOODMANS HI-FI 6in. WOOFER

8 ohm, 10 watt. Large ceramic magnet. 30-12,000 cps. Ideal P.A. Columns, Hi-Fi Enclosures Systems, etc. £4



ELAC CONE TWEETER - LATEST DESIGN

The moving coil diaphragm gives a good radiation pattern to the higher frequencies and a smooth extension of total response from 1,000 cps to 18,000 cps. Size 3 1/2 x 2 1/2 in. deep. Rating 10 watts. 3 ohm or 15 ohm models. £1.90 Post 10p

Horn Tweeters 2-16kc/s, 10W 8 ohm or 15 ohm £1.50

De Luxe Horn Tweeters 2-18 Kc/s, 15W, 8 ohm £3.
TWO-WAY 3000cps CROSSOVERS 3 or 8 or 15 ohm 95p.
SPECIAL OFFER: 80 ohm, 2 1/2 in. dia.; 35 ohm, 2 1/2 in.; 3in 25 ohm, 2 1/2 in. dia.; 3in. dia.; 8 x 4 in.; 8 x 5 in. £1 EACH
15 ohm, 3 1/2 in. dia.; 7 x 4 in.; 8 x 5 in. TYPE
8 ohm, 6 x 4 in. 3 ohm, 2 1/2 in. 5in. 5 x 5 in. 7 x 5 in.
LOUDSPEAKERS P.M. 3 OHMS. 8 1/2 in. £1.10; 8 x 5 in. £1.25; 8 x 2 1/2 in. 90p; 8 in. £1.75; 10 x 6 in. £1.90.
5in. WOOFER 3 watts max. 20-10,000 cps. 8 or 15 ohm £1.80.
ELAC 8 in. De Luxe Ceramic 3 ohm or 15 ohm £2.60.
RICHARD ALLAN TWIN CONE LOUSPEAKERS. 8in. dia. 4 watt; 10in. dia. 5 watt; 12in. dia. 6 watt 3 or 8 or 15 ohm models £1.95 each. Post 15p.

OUTPUT TRANS. EL34 etc. 25p; MIKE TRANS. 50.1 25p.
SPEAKER COVERING MATERIALS. Samples Large S.A.E.
GOODMANS OUTPUT TRANSFORMER 5 watt push-pull for valves EL84 etc. 3, 8 and 15 ohms 85p. Post 25p.

BAKER 100 WATT ALL PURPOSE POWER AMPLIFIER

4 inputs speech and music. Mixing facilities. Response 10-30,000 cps. Matches all loudspeakers. A.C. 200/250v. Treble and Bass controls. Guaranteed. Details S.A.E. £39 POST FREE



ALL EAGLE PRODUCTS

SUPPLIED AT LOWEST PRICES
ILLUSTRATED EAGLE CATALOGUE 20p. Post Free.

BARGAIN AM TUNER. Medium Wave. Transistor Superhet. Ferrite aerial. 9 volt. £4

BARGAIN 4 CHANNEL TRANSISTOR MIXER
Add musical highlights and sound effects to recordings. Will mix Microphone, records, tape and tuner with separate controls into single output. 9 volt. £3

BARGAIN FM TUNER 88-108 Mc/s Six Transistor. 9 volt Printed Circuit. Calibrated slide dial tuning. Walnut Cabinet. Size 7 x 5 x 4 inch £10

BARGAIN FM TUNER as above less cabinet £7.50

BARGAIN 3 WATT AMPLIFIER. 4 Transistor Push-Pull Ready built, with volume control. 9v. £3.50

COAXIAL PLUG 6p. PANEL SOCKETS 6p. LINE 18p.

OUTLET BOXES, SURFACE OR FLUSH 25p.
BALANCED TWIN FEEDERS 5p yd. 80 ohms or 300 ohms.
JACK SOCKET Std. open-circuit 14p, closed circuit 25p; Chrome Lead Socket 45p. Phone Plug 5p. Phone Socket 5p.
JACK PLUGS Std. Chrome 15p; 3.5mm Chrome 14p. DIN SOCKETS Chassis 3-pin 10p; 5-pin 10p. DIN SOCKETS Lead 3-pin 18p; 5-pin 25p. DIN PLUGS 3-pin 18p; 5-pin 25p. **VALVE HOLDERS, 5p; CERAMIC 8p; CANS 5p.**

E.M.I. TAPE MOTORS Post 15p.
120v. or 240v. A.C. 1,200 r.p.m. 4 pole 135mA. Spindle 0.187 x 0.75 in. £1.25
Size 3 1/2 x 2 1/2 in. (illustrated).
BALFOUR GRAM MOTORS
120v. or 240v. A.C. 1,200 r.p.m. 4 pole 50mA. Spindle 1/2 x 3/20. Size 85p
2 1/2 x 2 1/2 x 1 1/2 in. Post 15p

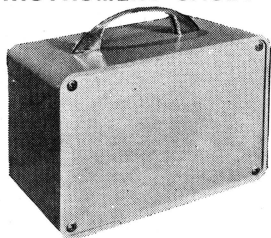
Minimum Post and Packing 15p

337 WHITEHORN ROAD, CROYDON
Open 9-6 p.m. (Wednesdays 9-1 p.m., Saturdays 9-5 p.m.)
Buses 133, 68 pass door. S.R. Stn. Selhurst. Tel. 01-684-1665

"Stella 99"

INSTRUMENT CASES

Size
6"W x 4"H
x 4"D



Price
£1.25p
+ 25p p.p.

We Believe the Finest Instrument Case in the Country. Beats all competitors for Price and strength

Fibreglass Press Moulded in Grey, and Blue. Supplied with 4 Rubber Feet. 18 SWG Alloy Chassis. 16 SWG Alloy Front Panel. Front Panel has Protective Film for marking out and protection. Chromed die cast handle. The case has two sets of Runners Moulded in which will take Alloy or P.C. Board Chassis. Same day off-the-shelf delivery. This size of case can be turned on end to make 4"W x 6"H x 4"D. Please advise if handle and feet to be supplied loose. Panel Punching available on 100 up. Trade and quantity discounts on request.

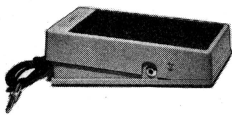
Full list of Accessories Available, sent with each order, i.e. Switches, Panel Lamps, Amplifiers, Fuses, etc.

E. R. NICHOLLS

46 Lowfield Road, STOCKPORT, CHESHIRE
Tel: 061-480 2179

WILSIC SOUND EFFECTS KITS

WAH-WAH PEDAL KIT (Illustrated)



Kit comprises a SELECTIVE AMPLIFIER MODULE KIT to convert the FOOT VOLUME CONTROL PEDAL (as photo) to Wah-Wah operation. Amplifier module £1.75, pedal unit £5.13, COMPLETE KIT £6.50 add 38p for assembly of module, but please note we cannot supply kits fully built.

REVERBERATION UNIT KIT. For dimension effect. Connects between sound source, mic., etc., and amplifier. Battery powered. COMPLETE KIT £9.20 (excluding case £7.50). Assembled in slimline cabinet £12.50. **VIBRATO UNIT KIT.** Foot pedal unit with variable speed and depth controls. COMPLETE KIT £5.25.

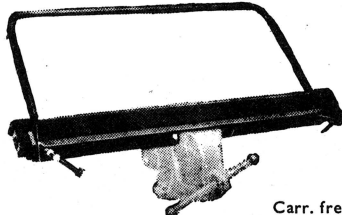
SEND 15p for the WILSIC PLANS BOOK, with full details of these kits; circuits, drawings and price lists.

LATEST CATALOGUE 5p (stamps)

WILSIC ELECTRONICS LTD.

6 COPLEY ROAD, DONCASTER, YORKS.

PARKERS SHEET METAL FOLDING MACHINES HEAVY VICE MODELS



With Bevelled Former Bars

Carr. free

No. 1. Capacity 18 gauge mild steel x 36in. wide ... £15.00
No. 2. Capacity 18 gauge mild steel x 24in. wide ... £10.00
No. 3. Capacity 16 gauge mild steel x 18in. wide ... £10.00
Also new bench models. Capacities 36in. x 18 gauge £30.00 24 in. x 16 gauge £29.00. Carriage free.

End folding attachments for radio chassis. Tray and Box making for 36in. model, 27p per ft. Other models 17p. The two smaller models will form flanges. As supplied to Government Departments, Universities, Hospitals. One year's guarantee. Money refunded if not satisfied. Send for details.

A. B. PARKER, Folding Machine Works,
Upper George St., Heckmondwike, Yorks.

Heckmondwike 3997

Everyday Electronics, December 1971

DISCOUNTS UP TO

60%

**ON BRANDED
GOODS**
ALL BRAND NEW
in manufacturer's sealed cartons.
GUARANTEED 12 MONTHS.

SONY · LEAK · SINCLAIR · TELETON · ARMSTRONG ·

THORENS · PHILIPS · K.E.F. · TEAC · ROGERS · PIONEER

SPECIAL OFFER £18.00

Garrard SP25 MkIII Goldring G800H Teak plinth and tinted cover. Ready wired for immediate use. Please add £1.25 for post and packing.

Sinclair PRO60/2 + Z30/PZ5	£15.00
Sinclair PRO 60/2 + Z30/PZ6	£17.75
Sinclair PRO 60/2 + Z50/PZ8	£22.95
Trans. ...	£4.70
Sinclair AFU	£49.75
Teleton SAQ206B (N.prod.)	£11.85
Wharfedale	£1.85
Sinclair IC12 integrated circuit amplifier	£1.85

TURNTABLES

Please add 50p for p. & p.

Garrard SP25 Mk III	£9.95
Garrard 2025TC with stereo cart.	£8.00
Garrard 2025TC with Sonotone 9TAHC	£8.95
Garrard 3000 with Sonotone 9TAHC	£10.25
Garrard SL65B	£13.25
Garrard AP76	£19.95
Garrard 401	£27.00
B.S.R. MP60	£18.00
Pioneer PL12AC	£36.00
Thorens TD125	£62.50
Thorens 150 AB11	£42.50
Goldring GL69/2	£19.50
Goldring GL69 P2	£26.50
Goldring GL75	£27.50
Goldring GL75P	£35.75

CARTRIDGES

Please add 10p for p. & p.

Goldring G850	£3.75
Goldring G800	£4.95
Goldring G800E	£10.50
Goldring G800SE	£15.25
Sonotone 9TAHC Diamond	£1.75
Shure M3DM	£4.75
Shure M445/7C	£7.00
Shure M55E	£8.75
Shure M75E	£12.50
Shure V15 Type 2	£28.00
Shure M44E	£7.00
Shure M31E	£8.50
Shure M32E	£8.00
Audio-Technica AT66	£4.95
Audio-Technica AT35	£12.95

AMPLIFIERS

Please add 50p for p. & p.

Alpha Highgate FA212	£27.50
Alpha Highgate FA300	£29.00
Alpha Highgate FA400	£33.00
Armstrong S21 (cased)	£41.95
Amstrad 8000 MkII	£18.95
Amstrad IC2000	£34.00
Dulci 207	£15.95
Dulci 207m	£21.00
Leak 30 Delta Range (New Prod.)	£53.75
Leak 70 Delta Range (New Prod.)	£64.50
Metrosound ST20	£24.75
Metrosound ST20E	£26.00
Philips R580	£18.00
Pioneer SA500	£36.00
Pioneer SA700	£65.00
Pioneer SA900	£92.00
Rogers Ravensbrook Chassis	£35.00
Rogers Ravensbrook Cased	£39.00
Rogers Ravensbourne Chassis	£43.75
Rogers Ravensbourne Cased	£48.00
Sansui AU101	£32.00
Sansui 555	£62.00
Sansui AU666	£75.00
Rotel 310	£32.00
Rotel 610	£49.00
Sinclair 2000 Mk. II	£22.50
Sinclair 3000	£32.50

KIT RADIOS

Please add 25p for p. & p.
Smallest radio in the world.
5 years guarantee.
Sinclair Micromatic ... £2.75
Sinclair Micromatic (ready assembled) ... £3.25
Batteries 14p extra.

PLINTHS & COVERS



£2.95 as illustrated plus 55p p. & p.
Finished in real teak veneer with tinted dust cover. Ready to use (fully assembled). Suitable for Garrard SP25; 2025TC; 3000; AT60; 2000; 2500; 3500; 5100; 1025; SL65B. Also for BSR McDonald MP60 and others.
Plinths and covers for AP76; AP75; SL72B; SL75; SL95B. £4.00 plus 55p p. & p.
Also finished in walnut to match Japanese equipment — no extra charge.



GLOBAL AUDIO DISCOUNT WAREHOUSES

Dept. E.E.2. 174 Pentonville Road, London, N1. Telephone 01-278 1769

Or: 4 High View Parade, Redbridge Lane East, Woodford Avenue, Ilford, Essex. Tel: 01-550 1086.

Open Monday to Saturday 9.30 a.m. to 6 p.m. **LATE NIGHT FRIDAY 7 p.m.**

MAIL ORDERS: Order with confidence. Send Postal Order, Cheque, Money Order, Bank Draft, Giro or Cash by Registered Mail. **CALLERS:** Please note that cheques can only be accepted together with cheque cards (not Barclay Card).

2 minutes from KING'S CROSS, EUSTON & ST. PANCRAS
on main road leading to the East and West Country

everyday electronics

PROJECTS...
THEORY.....

A DELICATE TOUCH

To anyone not previously familiar with the technical aspect of electronics, the constructional projects included in last month's issue were probably quite revealing. Not least in the modest quantity of parts involved and their small size. It is really surprising what can be achieved with just a few tiny components which one could hold quite comfortably in the palm of the hand.

Maybe it looks altogether too simple for words. And in a sense it is. But beginners should take their first steps with thought and care, and be duly appreciative of the need to develop a certain dexterity in the manual work involved: in the manipulation of the components and wiring, and in the making of good sound soldered joints. A delicate touch closely akin to that of the scientific instrument maker is the kind of manual skill required in modern electronic construction work.

WHAT'S IN A NAME?

It will be noted that we frequently use the word "gadget" as a general term of convenience applicable to most of the constructional projects featured in this magazine. We employ the word in its original sense, meaning a small fitting or contrivance. However, modern usage has tended to downgrade the word gadget so that in some minds it has become synonymous with "gimmick."

To avoid any misunderstanding, we must explain that all designs offered to private con-

structors are practical items, capable of providing definite useful functions. True some may have a rather more serious application than others, but all are designed to a purpose. For the want of a better or more appropriate term, "gadget" will continue to be used when referring to the small items of electronic equipment. But gimmicks pure and simple, or gimcrack items, will not be our concern.

PROVED DESIGNS

One further point must be made clear in this connection. All EVERYDAY ELECTRONICS projects are tested and proved by our own technical staff prior to being presented to our readers. We do not deal in "paper designs." A hobby is a hobby: nevertheless time is a valuable commodity, none more so than the "spare" variety. We want to help our readers use it profitably, enjoyably, and economically.

STOP PRESS

Our thanks to those who have already written following the publication of our first number. Next month we will publish a selection of readers' letters. We welcome all views, so why not drop us a line if you have not already done so?



Our January issue will be published on Friday, December 17

EDITOR F. E. BENNETT • ART EDITOR J. D. POUNTNEY • M. KENWARD • P. A. LOATES
ADVERTISEMENT MANAGER D. W. B. TILLEARD

© IPC Magazines Limited 1971. Copyright in all drawings, photographs, and articles published in EVERYDAY ELECTRONICS is fully protected, and reproduction or imitations in whole or part are expressly forbidden.

All reasonable precautions are taken by EVERYDAY ELECTRONICS to ensure that the advice and data given to readers are reliable. We cannot, however, guarantee it, and we cannot accept legal responsibility for it. Prices quoted are those current as we go to press.

Subscription Rates including postage for one year, to any part of the world, £2.35.

Everyday Electronics, Fleetway House, Farringdon Street, London, E.C.4. Phone: Editorial 01-634-4452; Advertisements 01-634-4202.

....EASY TO CONSTRUCT
....SIMPLY EXPLAINED



VOL. 1 NO. 2

DECEMBER 1971

CONSTRUCTIONAL PROJECTS

PHOTOGRAPHIC COLOUR TEMPERATURE METER	<i>For selecting camera filters</i>	<i>by D. Bollen</i>	78
WINDSCREEN WIPER CONTROL	<i>Part 2: Fitting to the car</i>	<i>by S. B. Squire</i>	85
DEMO DECK	<i>Circuit building and experimenting deck</i>	<i>by Mike Hughes</i>	99
FUZZ BOX	<i>Add weird effects to your music</i>	<i>by N. D. Jones</i>	104

GENERAL FEATURES

EDITORIAL		76
MEMORY STORE	<i>Retrieval by George Dunning</i>	83
SHOP TALK	<i>Your buying problems solved by Mike Kenward</i>	84
ELECTRONICS PAST AND PRESENT	<i>Part 2: by Prof. G. D. Sims</i>	87
TEACH IN	<i>Part 2: Electric Current by Mike Hughes</i>	93
SPECIAL TOOL KIT OFFER		97
RUMINATIONS	<i>by Sensor</i>	109
COMPONENT BUYING AND SUPPLYING	<i>Part 2: Suppliers by A. Sproxton</i>	110
EVENING ELECTRONICS	<i>Clubs and classes</i>	113

Special Offer

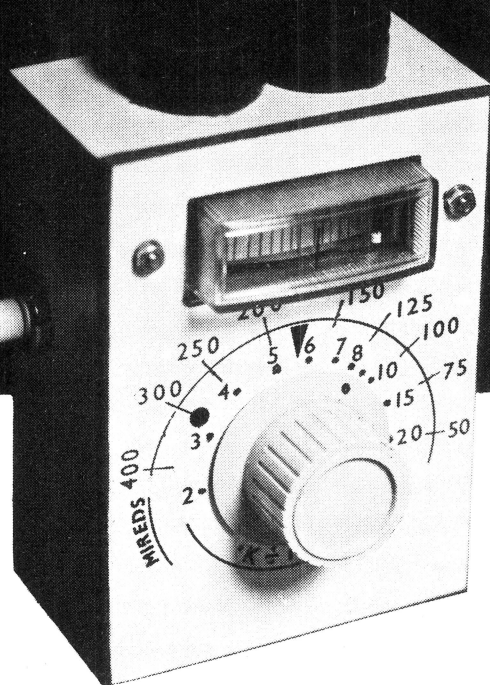
As a service to all our readers and especially those who are new to electronic construction we offer the Everyday Electronics Tool Kit at a special price. For further details of this offer see page 97.

Everyday Electronics, December 1971



Photographic Colour Temperature Meter

By D. Bollen



Get the colours right with this Photographic Colour Temperature Meter. It tells you simply and quickly what correction filters to fit to your camera.

PHOTOGRAPHERS who use reversal film to make colour transparencies often find that a particular shot turns out to have an unnatural red, yellow, or blue tinge. Unlike the human eye, a colour film cannot compensate for small changes in the "quality" of daylight and other light sources.

A film correctly balanced for standard daylight will record subjects under household tungsten lamp illumination with a deep red hue, but the most perceptive photographer sees the same scene as no more than orange-yellow. Similarly, a subject in shade under a clear blue sky is depicted as deep blue by the film, but is seen as bluish grey by the eye.

A simple colour temperature meter of the type described here will help to reduce the number of failures on a roll of film by showing when colour casts are present, and will also assist in the selection of camera filters to eliminate such casts.

COLOUR TEMPERATURE

If a black body such as a piece of carbon, is heated, it will exhibit a range of colours as its temperature increases, from a dull red, through orange and yellow, to a bluish white. Obviously, the colour of the carbon is closely related to its temperature, and the characteristics of most common light sources are close enough to that of

Approximate cost of components

£ 2.75 plus case

Components....

Resistors

R1 1k Ω
R2 2.2k Ω

All $\pm 10\%$, $\frac{1}{2}$ watt carbon except where stated.

Potentiometers

VR1 100 Ω horizontal skeleton pre-set
VR2 2k Ω slider type pre-set
VR3 500 Ω wire wound (1 watt type)

Light Dependent Resistors

PCC1, PCC2 ORP12 (2off)

Meter

ME1 100-0-100 μ A moving coil centre zero, stereo balance type

Switch

S1 Single pole push-to-make

Miscellaneous

B1 9V PP3 type
Cellophane (see text), knob with pointer.
Plain perforated s.r.b.p. board 2in x 1 $\frac{1}{2}$ in x 0.15in matrix and pins.
Formica for case or suitable plastic box.
Connecting wire
Battery connectors.
L.D.R. Holders (see text).

a black body to allow a similar correlation between colour and temperature to be used. Table 1 lists the equivalent colour temperatures of several kinds of light source.

One way of measuring colour temperature is by means of two photosensors, one behind a red filter and the other behind a blue filter, with the filters adjusted so that the sensors give equal outputs under standard daylight conditions. If the photosensors are then illuminated by a light source which is either more red or more blue than standard daylight, the sensor outputs will differ by an amount roughly proportional to the change of colour temperature.

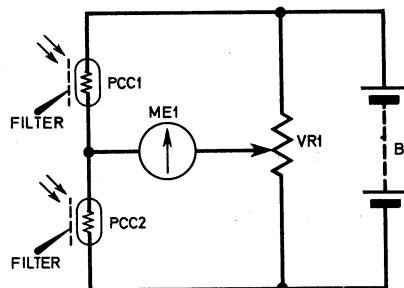


Fig. 1. Basic circuit diagram.

CIRCUIT OPERATION

It would be possible to wire the two photosensors in such a way that colour temperature could be read straight from a voltmeter scale, but this would involve taking the meter to bits for calibration, and an unwanted load would be placed on the photosensors by the internal resistance of the meter. Such an arrangement would also be sensitive to changes in battery voltage, so a nulling technique was chosen for the colour temperature meter, using an easily calibrated potentiometer.

In the basic circuit of Fig. 1, the photosensors are light dependent resistors (l.d.r.s) PCC1 and PCC2. The resistance of these l.d.r.s decreases when they are exposed to light. As long as both sensors are equally illuminated they should have similar resistance values irrespective of light intensity, and the voltage at the junction of the sensors will remain constant. The slider of potentiometer VR1 in Fig. 1 is adjusted to give the same voltage as the sensors so no current flows through centre-zero ME1, hence, no load is placed on the sensors.

Assume now that sensors PCC1 and PCC2 are provided with blue and red filters respectively. Under even illumination of both sensors, light

Table 1: COLOUR TEMPERATURE OF LIGHT SOURCES

Source	Temperature in degrees Kelvin
Candle	1,900
100 watt household lamp	2,800
Photoflood lamp	3,400
Direct sunlight, sunrise or sunset	2,000-4,000
Direct sunlight, noon	4,500-5,500
Sunlight plus white clouds or haze	5,900
Electronic flash or blue flash-bulbs	5,900
Sunlight plus clear blue sky	6,650
Light overcast	6,650-7,150
Heavy overcast	8,350
In shade, sunlight plus white clouds or haze	7,150
In shade, clear blue sky	9,000-25,000

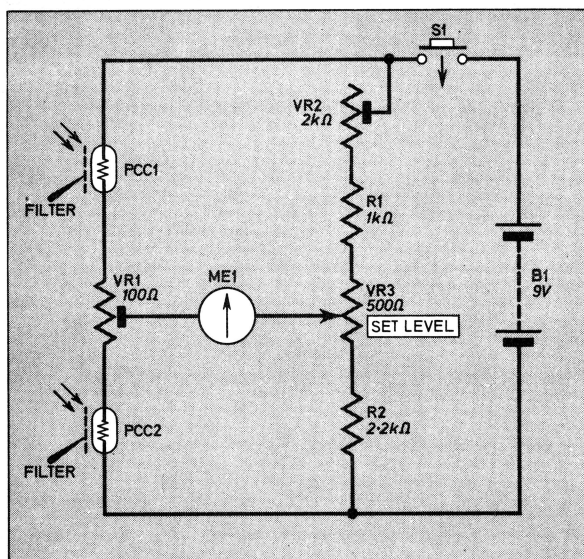


Fig. 2. Complete circuit diagram of the Photographic Colour Temperature Meter.

from a predominantly blue source will pass virtually unhindered through the blue filter to PCC1, but will be blocked by the PCC2 filter. Thus, with more light reaching PCC1, it will have a lower resistance than PCC2 and the voltage at the junction of PCC1 and PCC2 will rise, causing the meter pointer to deflect away from zero.

Much the same applies with red light, but here the meter pointer will deflect in the other direction as the voltage at the junction of PCC1 and PCC2 falls. Potentiometer VR1 is adjusted to bring the meter reading back to zero, and the change of colour temperature is given by the angular rotation of VR1 spindle.

CIRCUIT REFINEMENTS

The circuit of Fig. 1 would not work well in practice, for the following reasons. Sensors PCC1 and PCC2 would have to be perfectly matched if the instrument was not to respond to changes in light intensity as well as colour temperature, blue and red filters would have to be of known density and colour, and only a small centre portion of VR1 total track resistance would be usable.

In the complete circuit of the colour temperature meter Fig. 2, a low value potentiometer VR1 is inserted between PCC1 and PCC2 to eliminate l.d.r. resistance mismatch under high light intensities; this component also protects the sensors against an excessive current flow. In conditions of dim illumination, the resistance of the sensors can be equalised by masking one of them with a spot of ink or paint, as described later.

To simplify construction and reduce cost, the colour temperature meter uses simple blue and red filters made from several layers of coloured

cellophane (obtainable from most stationers), and VR2 is included in the circuit of Fig. 2 to correct individual filter variations and allow for circuit tolerances.

Calibrated potentiometer VR3 in Fig. 2 has a low track resistance in relation to the total resistance of the chain formed by VR2, R1, VR3 and R2, so that full use can be made of VR3 rotation to provide widely spaced calibration points.

CONSTRUCTION

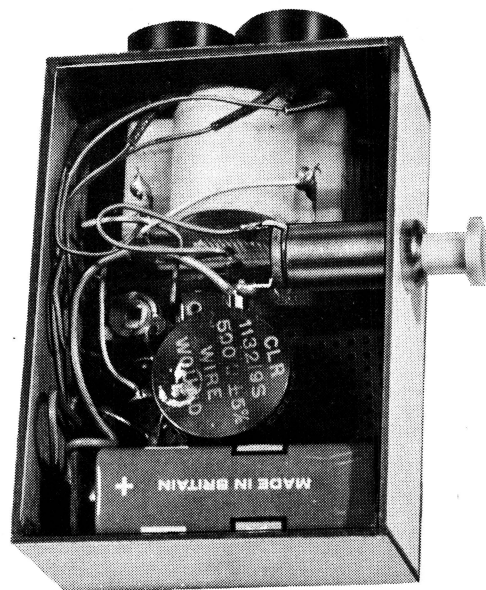
The case for the prototype was constructed from Formica, but almost any non-metallic case of suitable dimensions could be used. The case should be drilled to the dimensions given in Fig. 3 before any further construction is undertaken. Once the drilling is complete meter ME1 can be fixed as can the two l.d.r.'s.

The sensors PCC1 and PCC2 are housed in small, opaque cylinders made from plastic cigar holder stoppers or bottle tops, see Fig. 4. Each l.d.r. holder must be cut-down with a sharp knife to make the internal height equal to the height of the l.d.r., to ensure a wide-angle of light acceptance. Blue and red filters are fitted at a later stage. The l.d.r.'s are glued into the holders which are then glued to the case.

The preset potentiometers VR1 and VR2 are mounted on a piece of plain perforated s.r.b.p. board using mounting pins as indicated in Fig. 5. Potentiometer VR3 can then be mounted through a hole cut in the board and resistors R1 and R2 connected—one pin is used for R2. The board is then fixed inside the case using VR3 mounting.

Switch S1 can now be inserted through its

Photograph showing the inside of the Photographic Colour Temperature Meter.



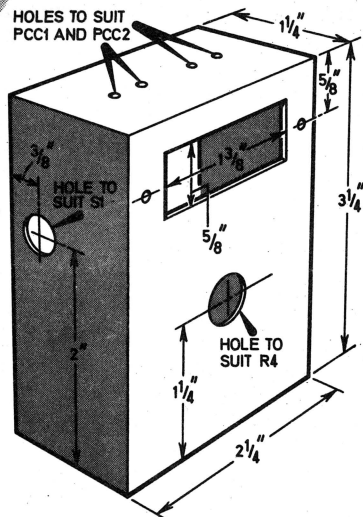


Fig. 3. Case drilling diagram.

Photographic Colour Temperature Meter

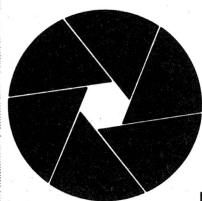
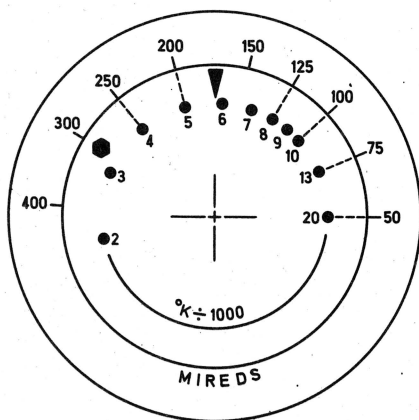


Fig. 6. Dial calibration.



▼ DAYLIGHT FILM
● ARTIFICIAL LIGHT FILM

Fig. 4. Details of the l.d.r. and filter mount.

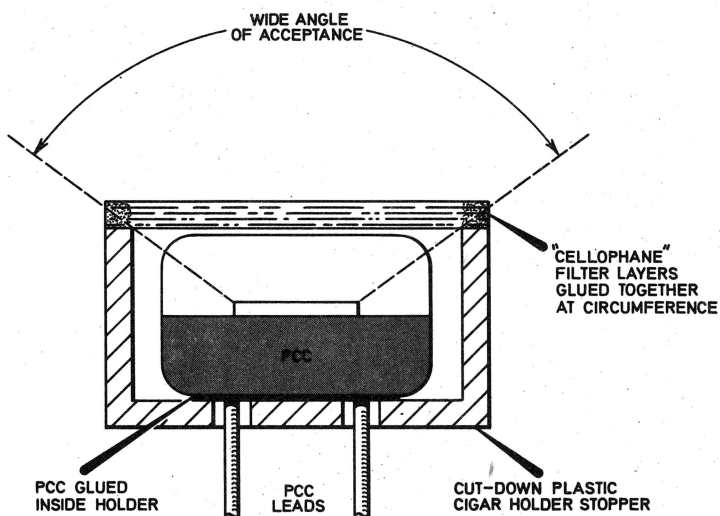
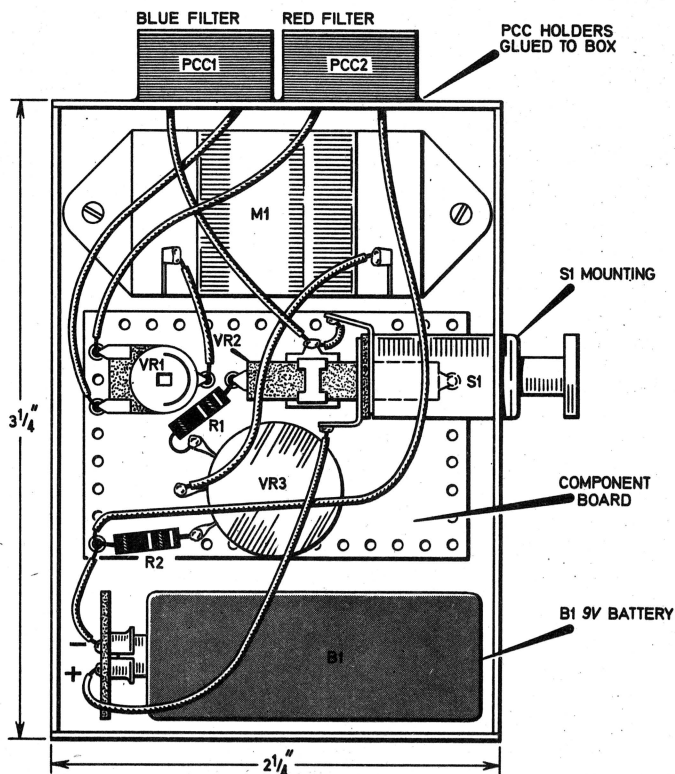


Fig. 5. Layout and wiring of the complete unit S1 is not mounted on the s.r.b.p. circuit board.



mounting hole and securely fixed. Finally, wire up the unit, as shown in Fig. 5, using p.v.c. covered stranded wire. Make sure to leave enough wire between S1 and VR2 wiper for adjustment of VR2. Connect the battery observing the correct polarity and the instrument is ready for setting up.

Apart from the need for both sensors to be placed side by side, as closely as possible, the instrument layout can be modified to suit individual requirements.

SETTING UP

Adjust VR1, VR2, and VR3 to the mid-track position. Place the colour temperature meter about 3 feet from a 100 watt pearl lamp, aligned so that PCC1 and PCC2 receive exactly the same amount of light. Press S1 and use the tip of a finger to find out which sensor needs masking to bring the pointer of ME1 to zero, then place a spot of ink or paint (black) on the face of the selected l.d.r. to achieve balance.

Next position the colour temperature meter with sensors almost in contact with the 100 watt bulb (maximum illumination), taking care that PCC1 and PCC2 receive the same amount of light. Adjust VR1 for zero balance.

The next stage is to prepare the red and blue filters, made from orange and pale blue (avoid mauve) cellophane respectively. Cut a paper disc to the outside diameter of the sensor holders. Fold orange and blue cellophane several times and cut out the filter discs with sharp scissors using the paper disc as a template. Glue four discs of blue cellophane on the PCC1 holder as shown in Fig. 3.

Take the colour temperature meter out of doors on an overcast day, well away from walls or trees. Set VR3 to the mid position and commence placing red filter discs over PCC2 until ME1 reads near zero when S1 is pressed. About twelve orange cellophane discs (red filter) will be required because the l.d.r. is more sensitive to red than blue light. The red filter discs can now be glued on the PCC2 holder, and the meter is ready for calibration.

CALIBRATION

In the absence of standard light sources, the following method of calibration is suggested. Make a temporary paper disc dial for VR3, with the scale shown in Fig. 5 lightly pencilled in. Set the pointer of VR3 at 2,800 degrees Kelvin and position the colour temperature meter a few inches from a 100 watt pearl bulb. With PCC1 and PCC2 equally illuminated, press S1 and adjust VR2 for zero balance.

For the next calibration check, choose a heavy overcast day, within an hour of noon, and set VR3 pointer to 8,350 degrees Kelvin in summer, 8,100 degrees Kelvin in spring or autumn, or 7,800 degrees Kelvin in winter. With sensors pointing straight up at the sky, press S1 and

observe the null meter. If the meter does not read zero, adjust VR3 for a null and mark the position of VR3 pointer on the paper disc dial. It should now be possible to gauge the discrepancy, if any, between the VR3 setting and the scale of Fig. 5.

If necessary, reposition the pointer knob on VR3 spindle and go through the above checks again for a new setting of VR2 until agreement is reached with the Fig. 5 scale. It is recommended that the temporary VR3 scale be left on the temperature meter for a few weeks so that various checks can be made, using Table 1 as a guide, and transparencies can be evaluated. When satisfied with results, a permanent scale can be made for VR3. A more accurate calibration technique is possible if several colour correction filters are available.

MIREN VALUES

Special correction filters may be placed in front of a camera lens to modify the colour temperature of light falling on the film. If the scene being photographed has a blue cast, a reddish filter of the right grade will give the transparency a normal colour balance. Correction filters are also used to achieve special effects, and to match a daylight type film to artificial light or vice versa. There is, however, a practical difficulty in selecting the right filter for the job. A given grade of filter will have a much greater effect at higher colour temperatures than at lower ones.

To make the process of filter selection simple, correction filters are graded in values based on the reciprocal of colour temperature, called the mired, see Fig. 5 and Table 2. A given grade of filter will always produce the same amount of correction anywhere on the mired scale.

Colour correction filters are identified by the letter R or B (standing for red or blue) followed by a number which is the filter rating in mireds divided by ten. For example, an R6 filter will make the colour of a light source more red by an amount corresponding to a shift of 60 mireds. Two filters placed together have an additive effect, a B6 plus a B12 will give a total shift towards blue of 180 mireds.

When the colour temperature meter has been roughly calibrated, it is a simple matter to interpolate between major calibration points with correction filters. Suppose that the colour temperature meter is reading the light from a 100 watt bulb with VR3 set to 2,800 degrees Kelvin (356 mireds), a B12 filter interposed between PCC1, PCC2, and the light source will raise the effective colour temperature by $356 - 120 \text{ mireds} = 4,240 \text{ degrees Kelvin}$, thus giving a fresh calibration point. With several filters, and a few known light sources, the whole colour temperature scale can be filled in by the above method.

USING THE METER

Since the object of the meter is to measure the colour of light sources only, avoid reflected light from brightly coloured objects, clothes, and green grass, etc.

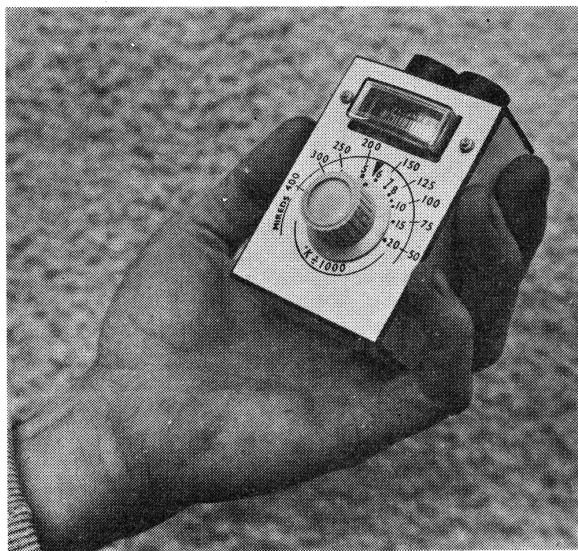
To take a shade reading out of doors, either stand in the shade of a neutral colour building with the meter pointing away from it towards the sky, or interpose the body between the meter and the sun. Always make sure that both sensors receive the same amount of light.

To measure the colour temperature of sunlight, the best method is to angle a sheet of white

paper towards the sun and take a reading from the paper. A similar method can be employed to take an integrated reading of mixed sunlight and skylight, by having the sheet of paper horizontal with the meter looking down at it. Alternatively, point the meter straight up at the sky with the sun illuminating both sensors evenly from front or back. □

Table 2: COLOUR TEMPERATURE AND MIREDS SCALES

Degrees Kelvin	Mireds
2,500	400
2,850	350
3,330	300
4,000	250
5,000	200
6,650	150
8,000	125
10,000	100
13,300	75
20,000	50

$$\text{Mireds} = \frac{1,000,000}{\text{degrees Kelvin}}$$


MEMORY STORE

by George Dunning

MY Father, like most of his contemporaries, had been during the late twenties an enthusiastic d.i.y. wireless constructor. Evidently, the radio we know was evolved on hundreds of breadboards in back kitchens—from delicate crystal sets through temperamental t.r.f.s with leaky grids to superhets with horn loudspeakers—by amateurs such as he.

One of my earliest recollections was of a great moment, when after much adjustment and careful tuning he summoned the whole household to the earphones. After a dramatic silence during which the phones were passed around, everybody joyfully agreed that it definitely was the sound of a violin and the earphone was held to my tiny ear to witness the historic event.

Not long after that, fairly reliable sets with cone speakers appeared on the market: the enthusiasm for wireless construction waned and the whole paraphernalia was retired to the shed.

Many years later in a dark corner I discovered a large toroidal

coil and on blowing the dust from its label I read "What are the wild waves saying?" My curiosity was aroused and I asked the inevitable question: "How does wireless work, Dad?" His answer was curt and final; "You've no time to fiddle about with that, lad while there's studies to attend to". It remained a mystery—a thing I dismissed from my mind so that in time I not only did not know, but I did not want to know about things electronic; they were not my line of country.

And so it remained until the mid fifties. At that time I was working as a routine chemist and I began to notice how the advent of electronics enabled automatic physical methods to cut out some of the lengthy analytical chemical methods. It became increasingly clear that my livelihood would eventually be threatened and so, in short, I decided that as I could not beat them then I must join them. Accordingly I enrolled for evening classes in Telecommunications.

Thus I entered the world of electronics comparatively late in life. The wireless theory I acquired led me naturally via journals such as *Practical Wireless* and later

Practical Electronics to the fascinating hobby of electronic gadgetry. No elaborate workshop was needed. Armed with a multi-range meter, a soldering iron and a pair of strippers most projects could be tackled on the kitchen table.

For me the fascination lies in innovation. I cannot ever remember having copied a constructional item, component by component. My projects are usually a hotch-potch of several past constructional features and ideas arranged so as to exploit some component new to the amateur market: a thyristor replacing a relay, an i.c. replacing both vibrator and amplifier together. The excitement comes in finding out if it will work.

Looking back, I would say that by learning the theory first I gained greater pleasure and was able to build more efficiently sooner—but it was by no means essential to efficient construction. With only a knowledge of Ohm's Law and a healthy respect for Finnigan's Law anyone at any time can jump in at the deep end and soon be swimming around with those hitherto strange fish; the amateur constructors.

USING THE METER

Since the object of the meter is to measure the colour of light sources only, avoid reflected light from brightly coloured objects, clothes, and green grass, etc.

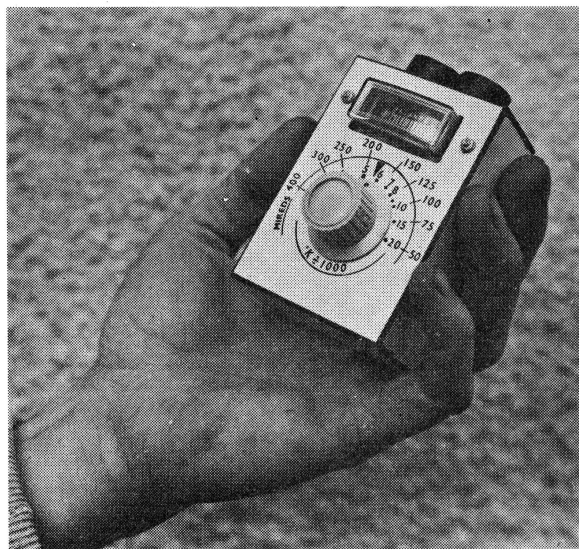
To take a shade reading out of doors, either stand in the shade of a neutral colour building with the meter pointing away from it towards the sky, or interpose the body between the meter and the sun. Always make sure that both sensors receive the same amount of light.

To measure the colour temperature of sunlight, the best method is to angle a sheet of white

paper towards the sun and take a reading from the paper. A similar method can be employed to take an integrated reading of mixed sunlight and skylight, by having the sheet of paper horizontal with the meter looking down at it. Alternatively, point the meter straight up at the sky with the sun illuminating both sensors evenly from front or back. □

Table 2: COLOUR TEMPERATURE AND MIREDS SCALES

Degrees Kelvin	Mireds
2,500	400
2,850	350
3,330	300
4,000	250
5,000	200
6,650	150
8,000	125
10,000	100
13,300	75
20,000	50

$$\text{Mireds} = \frac{1,000,000}{\text{degrees Kelvin}}$$


MEMORY STORE

by George Dunning

MY Father, like most of his contemporaries, had been during the late twenties an enthusiastic d.i.y. wireless constructor. Evidently, the radio we know was evolved on hundreds of breadboards in back kitchens—from delicate crystal sets through temperamental t.r.f.s with leaky grids to superhets with horn loudspeakers—by amateurs such as he.

One of my earliest recollections was of a great moment, when after much adjustment and careful tuning he summoned the whole household to the earphones. After a dramatic silence during which the phones were passed around, everybody joyfully agreed that it definitely was the sound of a violin and the earphone was held to my tiny ear to witness the historic event.

Not long after that, fairly reliable sets with cone speakers appeared on the market: the enthusiasm for wireless construction waned and the whole paraphernalia was retired to the shed.

Many years later in a dark corner I discovered a large toroidal

coil and on blowing the dust from its label I read "What are the wild waves saying?" My curiosity was aroused and I asked the inevitable question: "How does wireless work, Dad?" His answer was curt and final; "You've no time to fiddle about with that, lad while there's studies to attend to". It remained a mystery—a thing I dismissed from my mind so that in time I not only did not know, but I did not want to know about things electronic; they were not my line of country.

And so it remained until the mid fifties. At that time I was working as a routine chemist and I began to notice how the advent of electronics enabled automatic physical methods to cut out some of the lengthy analytical chemical methods. It became increasingly clear that my livelihood would eventually be threatened and so, in short, I decided that as I could not beat them then I must join them. Accordingly I enrolled for evening classes in Telecommunications.

Thus I entered the world of electronics comparatively late in life. The wireless theory I acquired led me naturally via journals such as *Practical Wireless* and later

Practical Electronics to the fascinating hobby of electronic gadgetry. No elaborate workshop was needed. Armed with a multi-range meter, a soldering iron and a pair of strippers most projects could be tackled on the kitchen table.

For me the fascination lies in innovation. I cannot ever remember having copied a constructional item, component by component. My projects are usually a hotch-potch of several past constructional features and ideas arranged so as to exploit some component new to the amateur market: a thyristor replacing a relay, an i.c. replacing both vibrator and amplifier together. The excitement comes in finding out if it will work.

Looking back, I would say that by learning the theory first I gained greater pleasure and was able to build more efficiently sooner—but it was by no means essential to efficient construction. With only a knowledge of Ohm's Law and a healthy respect for Finnigan's Law anyone at any time can jump in at the deep end and soon be swimming around with those hitherto strange fish; the amateur constructors.

UNFORTUNATELY we have to write the copy for Shop Talk before the previous issue is on sale and hence no "feedback" from you, the readers, is available to tell us if indeed we did solve all your buying problems. However, if any general buying points do arise from various articles we should be able to deal with them in the following issue.

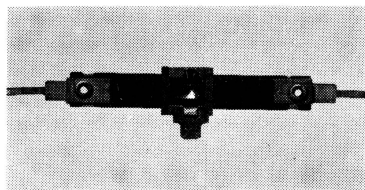
Having had a few phone calls concerning R.S. Components arising from another source it is possibly worthwhile reinforcing what was said last month, and also to mention that one or two firms are now specialising in R.S. Components parts and a look at adverts at the back may be advantageous.

After looking through the components lists this month it would appear that nearly all the components are readily available.

Photographic Colour Temperature Meter

The slider preset potentiometer may not be easy to get for the *Colour Temperature Meter*, other types could be used but the slider fits in well. Some of the London shops should be able to help if your supplier cannot. The push button used by the author will probably not be obtainable but any "press for on" push button that is not too big should be all right; there are a number generally available.

The original case looks very neat and is made of white Formica, held together with Araldite.



Fuzz Box

Well, the *Fuzz Box* should be straightforward as far as buying goes. Once again the author's case looks neat and is both strong and inexpensive.

Demo Deck

Take note of the piece about RS Components above and you should have few problems in buying for the *Demo Deck*. Strangely enough, the only real buying problem Mike Hughes had was in



obtaining the 0.06 amp (60 milli-amp) bulbs. If you cannot get them Home Radio are the people to write to.

Our *Demo Deck* cabinet was made by a professional from Afrormosia Mahogany and looks very presentable. Obviously, many people could not make up such a good cabinet but our design is recommended as it has facilities for all the necessary bits and pieces.

Teach-In

If you have any problems buying those few resistors for next month's *Teach-In*, you are just not trying. If you get 5 per cent types so much the better, they will probably not cost any more.

New Products

To protect your hands, clothing, the kitchen table and even carpets, a soldering iron stand is a must. You should never hang your iron on equipment or the edge of a table as it is all too easy



to reach across it and burn a hole in your clothing or skin.

If you have an area where you can set up a permanent work bench then buy a good stand and screw it to a bench. If you have to move around or use "borrowed space" then buy a good free-standing iron stand. This will help when you clear the work area as you can move the iron in the stand without having to wait or it to cool.

There are many stands available and most iron manufacturers make a stand for their irons. One universal one that was sent to us some time ago is shown in use with an Adcola Invader Iron left. This stand is well constructed and is available as a free standing or bench mounted type, and will take any iron with an element diameter less than $\frac{1}{2}$ inch. It is attractively finished in red anodised aluminium, with a tip cleaning pad, made by Stangard and is available from Home Radio (Components) Ltd., for £1.33 (bench mounted) or £1.83 (free standing as shown).



Bradewick is a sort of "solder sucker," it is designed to remove solder from joints being desoldered. This should prove useful when working on the *Demo Deck* as it will prevent those large blobs of solder from building up around the tag posts.

To desolder a joint, simply apply the wick simultaneously with a soldering iron, the wick will soak up the solder as it melts. The solder-filled part of the wick can then be cut off.

Bradewick is available in four width sizes from 0.025 inch to 0.1 inch, the 0.075 inch sizes (Green Label) should suit most constructors. Available from Light Soldering Developments Ltd., 28 Sydenham Road, Croydon, CR9 2LL, or retail shops, the cost is 90p for approximately five feet of any width.

Windscreen Wiper Control

Part Two
By S.B. Squire

LAST month we showed how the unit can be fitted to cars with single speed field coil motors however, some cars are fitted with two speed wipers using a field coil motor, the wiring diagram for these motors is shown in Fig. 6a, Fig. 6b shows how the unit is wired to this system. If required the unit may be used to operate the wipers at either of the two speeds depending on the wiper switch position (1 or 2) that the yellow wire from RLA1 is connected to. Wiring shown in Fig. 6b is for positive earth, reverse X and Y for negative earth systems. The green wire is not used and need not be fitted.

PERMANENT MAGNET MOTORS

During the last few years permanent magnet wiper motors have been fitted to many cars and these motors are wired up as shown in Fig. 7a. You will notice that the parking switch shorts out the motor when it is turned off. This is so that the motor stops quickly. Most cars fitted with permanent magnet wiper motors are wired negative earth and Fig. 7b shows how the unit

is wired to such a system. Notice that the wire between the wiper switch and the parking switch is broken and the normally closed side of the set of changeover relay contacts inserted in this line (green and blue wires from RLA1).

The normally open contact (yellow wire from RLA1) is wired to the other side of the wiper switch. The blue wire must be wired to the wiper switch—the non earth side.

If your car has a permanent magnet motor and is wired for positive earth, simply reverse wires X and Y shown in Fig. 7b.

The fourth and final system is the two-speed permanent magnet type, again usually wired for negative earth. It is possible to use this unit with these motors but only on the first switched speed, reference to Fig. 8a will show the car wiring normally used with such a motor and Fig. 8b shows how to wire the unit to the motor, note that the normally closed side of the change-over contacts are wired between the wiper switch and the parking switch (blue and green wires from RLA1) while the third—normally open contact (yellow wire from RLA1) is wired

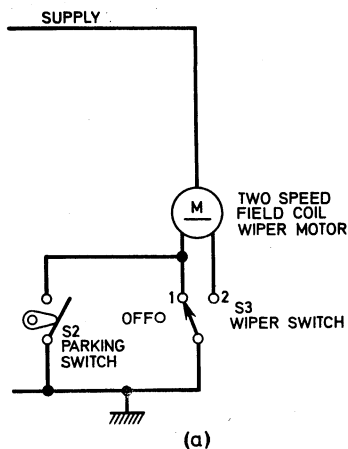


Fig. 6a. Wiring diagram for a two speed field coil wiper motor.

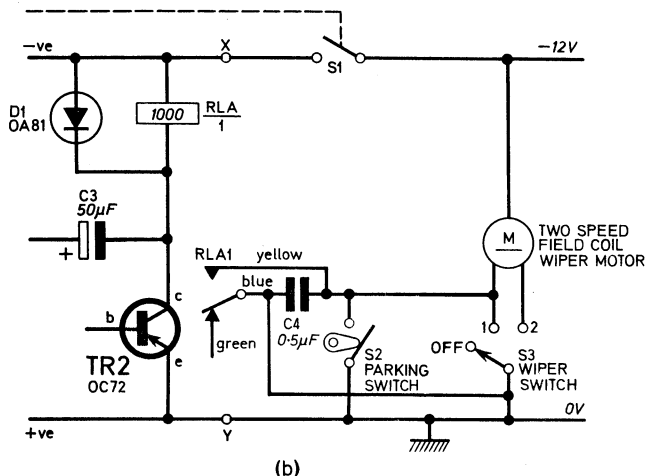


Fig. 6b. Showing how the unit is wired to a two speed field coil system—positive earth shown. In this configuration either speed can be used depending on which wiper switch position the yellow wire is connected to.

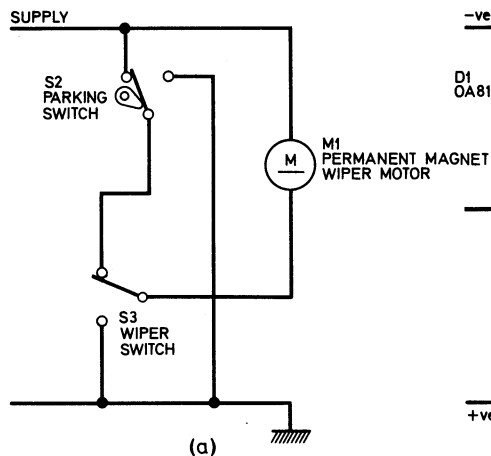


Fig. 7a. Wiring diagram of a three wire permanent magnet wiper motor.

to earth. The centre contact (blue) must be connected to the wiper switch as shown.

If your car has a positive earth two-speed permanent magnet motor simply reverse wires X and Y.

IDENTIFYING THE CAR WIRING

You should be able to determine the type of motor used in your car from the number of connecting wires on the switch, i.e., 2 wires (single speed)—field coil; 3 wires (two-speed)—field coil dual speed; 3 wires (single speed)—permanent magnet; 4 wires (two-speed)—permanent magnet. It should be possible to obtain a wiring diagram and find out which colour wires go where and how the various switches are wired up, but if this is not possible then you

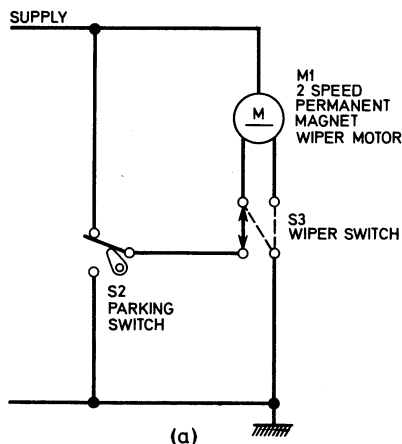


Fig. 8a. Wiring diagram for a two speed permanent wiper motor.

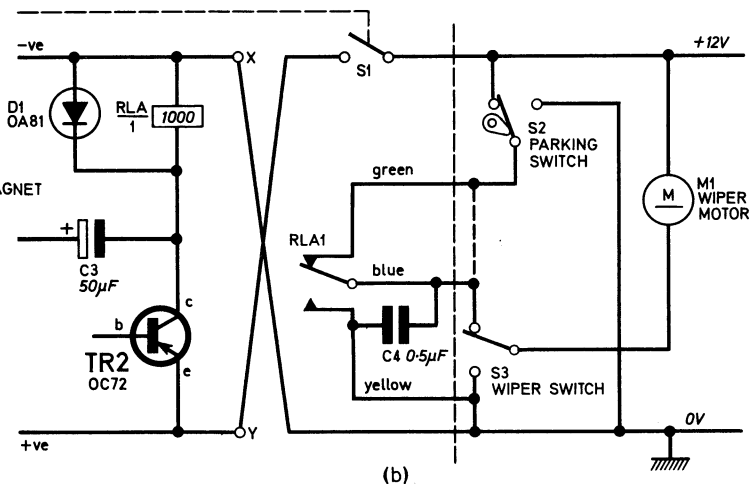


Fig. 7b. Showing how the unit is wired to be used with a permanent magnet motor. Note that the wire between the wiper switch and the parking switch has to be disconnected, and the relay contacts wired in. Negative earth system shown.

will have to trace the wires on the car to find out how to wire in your controller.

OPERATION

Once the unit is fitted to the car it is operated without touching the normal wiper switch. With the wipers off, switching on the unit will give one wiper sweep (back to the park position) approximately every five seconds. Further rotation of the control knob will increase the time interval between sweeps up to approximately 25 seconds. The 0 to 10 scale on the knob can be used as a guide to the delay time.

For normal operation of the wipers simply switch off the unit and turn on the wiper switch. in the normal way. ■

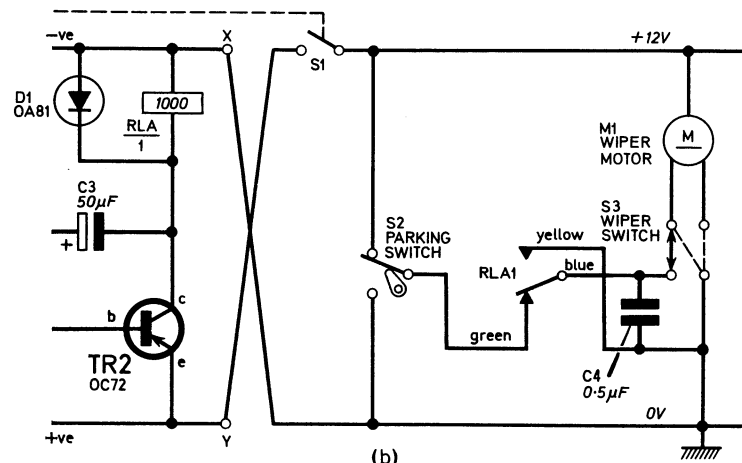
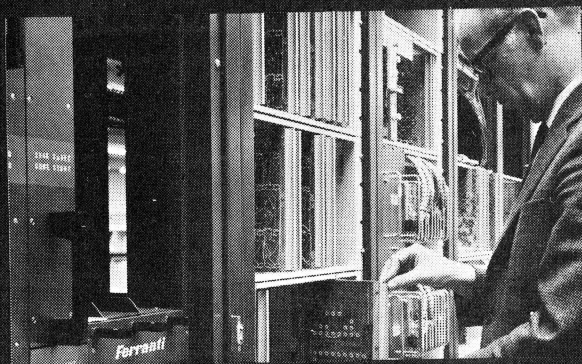
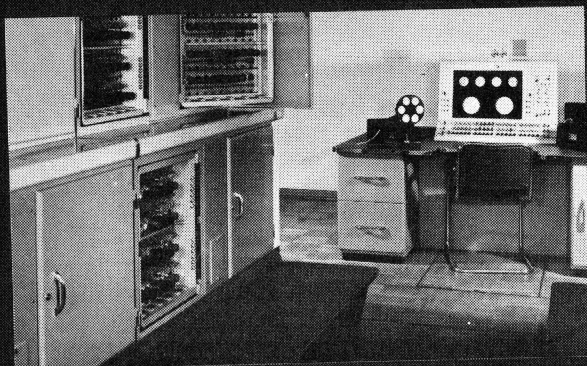
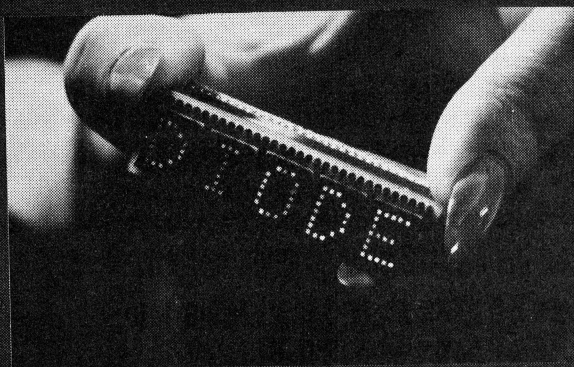


Fig. 8b. Showing how the unit is wired for a two speed permanent magnet wiper motor. Note that the wire between the motor and the first switch position must be disconnected and the relay contacts wired in. Negative earth system shown.

electronics



PAST & PRESENT

By Prof. G.D. Sims, OBE, PhD *(Southampton University)*

The second half of our story opens with the introduction of integrated circuits—and the beginning of microelectronics. Some of the significant new applications that have already emerged as a result of technological developments are mentioned, and finally, some likely prospects for the future are discussed.

Top left: Cold cathode neon filled numerical indicator tubes. Such devices are used in electronic measuring and computing equipment to provide visual readout of data *(Mullard)*

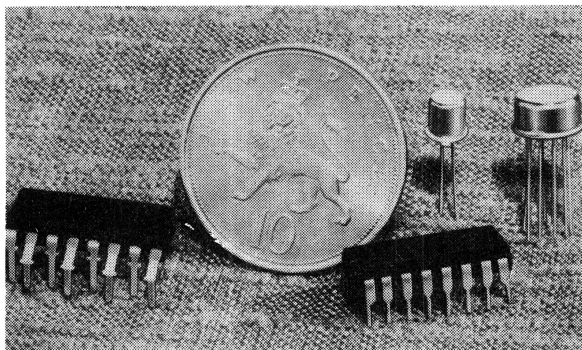
Bottom left: Ferranti Mark I Computer at Manchester University 1951. This was the first British electronic computer. It employed 3,000 valves, and a refrigeration system; cathode ray tubes were used as data stores, in addition there was a magnetic store. This picture shows just part of the computer, the central processor and the control desk *(Ferranti)*

Top right: Small size solid state display made up from a matrix of tiny gallium arsenide phosphide light-emitting diodes. Can be arranged to provide numbers or words of any length *(Marconi)*

Bottom right: The latest Ferranti Computer, Argus 500, is a fast computer system for on-line applications. The central processor, the sub-unit at extreme left of picture, can operate with one microsecond core stores. Compare this small sub-unit with the large cabinets required to house the central processor of the Mark I *(Ferranti)*

THE success of microelectronics as we know it today stems largely from the exploitation of the silicon planar process. A typical integrated circuit may contain a number of transistors, resistors and capacitors all made within the same silicon "chip" the interconnection pattern between them being evaporated on after all of the components have been formed. "Large scale integrated circuits" can contain thousands of devices all made in the same piece of silicon.

The majority of integrated circuits commercially available at the present day, however, are the simpler ones and these alone open up a host of new possibilities in electronic design for both professional and amateur alike.



Integrated circuits for colour television. From left to right: colour demodulator, central signal processor, voltage reference source, and inter-carrier sound i.f. and detector (Mullard)

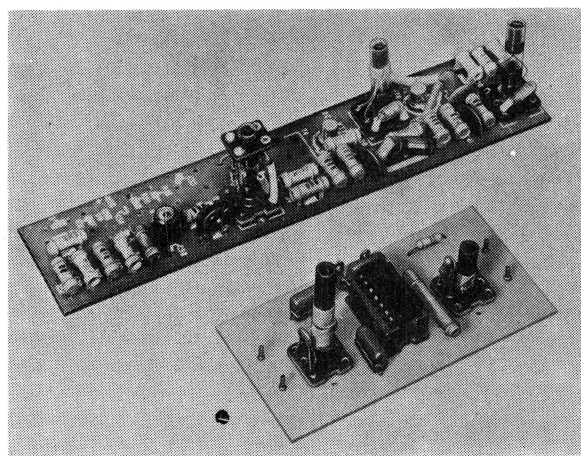
LINEAR INTEGRATED CIRCUITS

Whereas at one time the task of wiring up separate components to form an amplifier was "bread and butter" to the engineer, it is now often possible to buy a suitable amplifier integrated in a single chip and ready for use. "Linear" integrated circuits (such as amplifiers) are commonly available in a variety of forms and can be regarded as the design blocks of our future systems in much the same way that the transistor, and earlier still the valve, were in the past.

DIGITAL INTEGRATED CIRCUITS

Integrated circuits, however, have come to be most widely used in "digital" (pulse) applications such as those involved, for example, in the design of the computers to which we have referred.

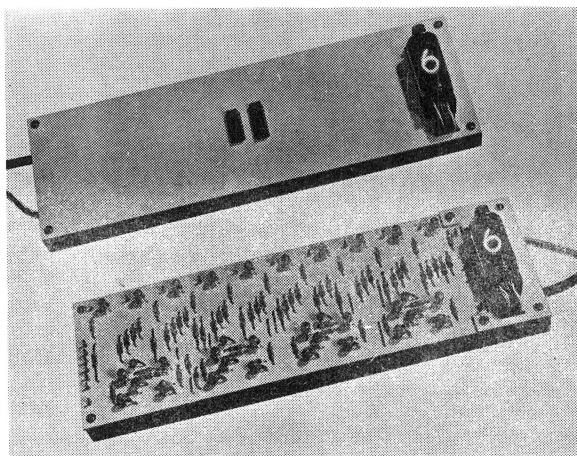
We have already drawn attention to the fact that electronic circuits can make yes/no decisions and hence "think". The design of "thinking" systems therefore is very much concerned with the design of "logical systems", which perform deductive tasks in much the same way that a human being does. It is this link with logic which has given impetus to much of the digital integrated circuit development.



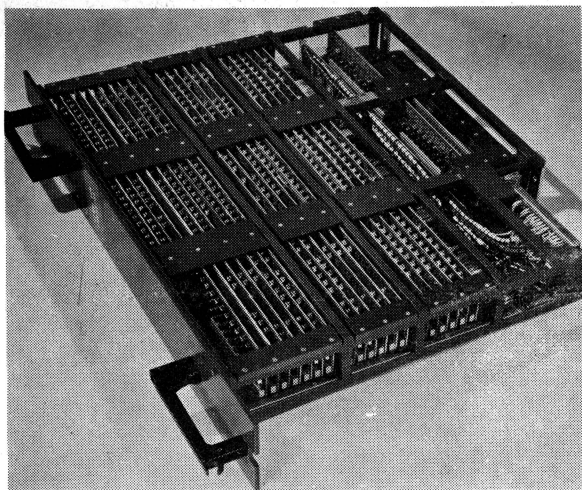
Contrast between the conventional "discrete component" version of a colour receiver i.f. amplifier, and one incorporating a linear integrated circuit (Mullard)

Many "families" of such integrated circuits are available, each forming a comprehensive range of logical functions and some of these are now extremely cheap to buy. In many other applications besides computing, for example in control systems and in communications, it is better to design in terms of digital building blocks rather than around the linear circuits traditionally used; and many future developments, of increasing interest to amateurs, will centre around the uses of these digital modules.

The microcircuit therefore is the key to our future. Let us look at the advances which electronics has made possible in recent years and at the same time some of the problems which lie ahead.



Decade counter using two digital integrated circuits (top) compared with a similar device using discrete components (Mullard)



The central processor of the Argus 500 Computer. This unit incorporates 980 integrated circuits and 220 discrete semi-conductor devices; and is 30in. high, 22 deep and 5in. wide (Ferranti)

MAN/MACHINE PROBLEMS

One area which is currently exciting great interest is the man/machine interface problem, coupled with the question of how can we replace human functions by electronic systems?

At the present time electronic systems exist which can learn fairly satisfactorily to read even handwriting, though as yet they are far from being sufficiently perfect for use, for example, in letter or parcel sorting. However, if standard alphabets are used the possibility of such tasks as stock control being performed by machines which scan invoices and ultimately, perhaps, even audit books, seems to be within the realms of the possible.

A related problem is concerned with the identification and artificial production of those

attributes of sounds which characterise speech. Clearly knowledge of this kind is vital also to the elimination of those characteristics which produce discomfort in human beings and to the alleviation of noise pollution generally.

Similar techniques to those used in this field of "pattern recognition" can also be used in medical diagnosis to compare patient information with that of previous cases in order to predict appropriate methods of treatment.

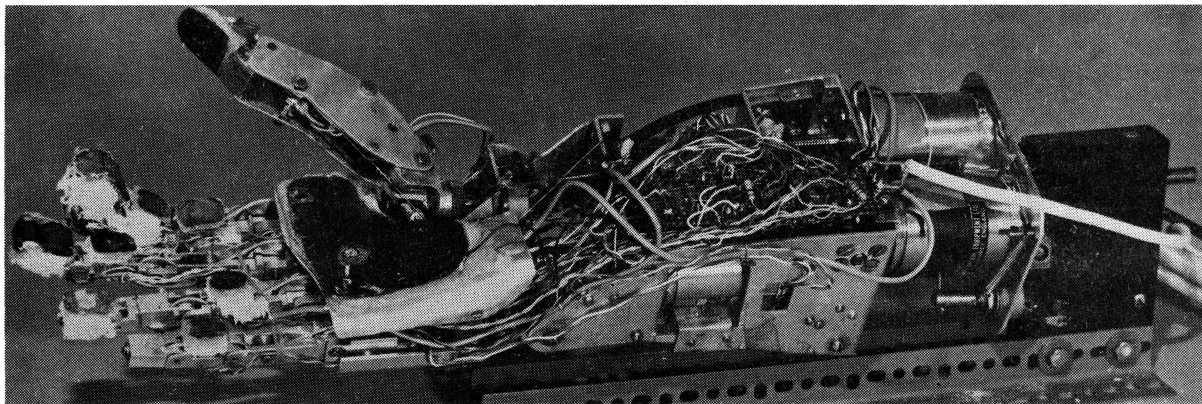
All of these applications depend upon suitable electronic circuits which will recognise, classify, identify and compare, symbols, signals or noises, and it is only with the coming of cheap electronics that such systems—previously regarded as being too expensive or too complicated to make—are now possible.

ELECTRONICS AND "MEDICINE"

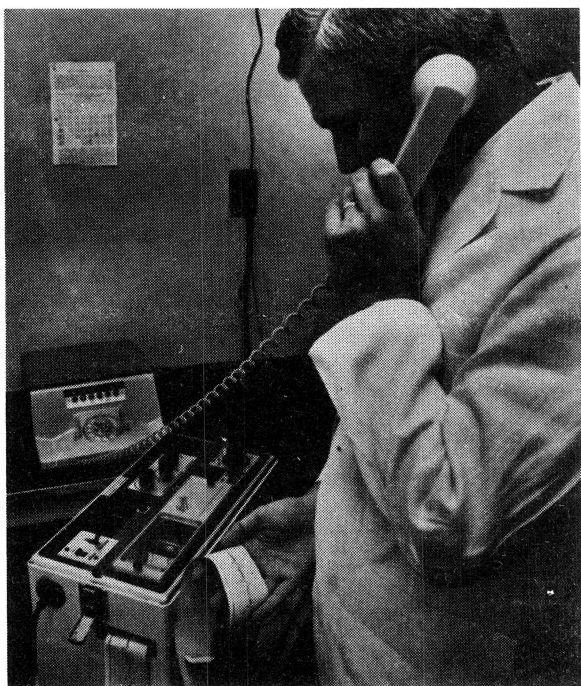
Mention of the medical field touches upon one of those areas where electronics has now started to make very significant contributions; we can for example now produce an artificial hand so sensitive that it can pick up fragile objects without crushing them and so positive that it can hold objects tightly, merely when the human mind controlling the hand thinks that it wishes to perform one or other of these functions. Such a hand is actuated by signals from nerve endings in the body and will imitate any movement which a natural hand would have performed.

Further development is still needed before such aids find general application as certain electromechanical problems still exist, but the pure electronics, which interprets the nerve signals and controls the hand motion, can now be reduced to a volume and weight compatible with a normal limb size: all of this thanks to the development of microelectronic techniques.

A related application also envisages the use of



Prototype model of adaptive artificial hand. It is driven by six compact d.c. permanent magnet motors and contains about thirty transducers. These provide the control system with detailed information about the object being grasped such as its shape, position and stability; they also monitor the forces, velocities and positions of the digits. This experimental device weighs twice as much as its human counterpart. Commands for the control system are derived from myoelectric signals produced by the operator (Dept. of E.E., Southampton University)



Diagnosis by Computer. This heart specialist in the United States uses an electronic telephone to transmit a patient's heart record from this electrocardiograph to a computer. The computer will analyze the signals and return a diagnosis in about two minutes (*U.S. Information Service*)

microelectric techniques to produce feedback signals to control nervous or spasm conditions, or to make up for damage to the nerve paths, which act as the normal communication channels between the brain and limbs, such as might be associated with some forms of paralysis. A whole family of related devices, which is now coming under consideration, involves such items as talking aids for those with speech defects, or typing aids for those who have lost the use of limbs.

A voice operated typewriter, actuated by spoken signals in the form of a kind of morse code, can now be made and the possibilities which this kind of device opens up are tremendous. One could, for example, now envisage a small computer making its time available to a range of aids of this type, enabling a complete office or workshop to be manned by people who were disabled in one way or another.

The fact that electronics could now offer employment possibilities to the handicapped is both important and exciting and could not have been contemplated a few years ago. In this area, however, we are only just at the beginning of the road.

AUTOMATED DESIGN AND PRODUCTION

Many other previously manually executed jobs

of course are now already performed by special purpose computer systems. For example, electronic control of machine tools is finding increasing use in industry.

In this case the operator specifies to the control system just what shape the machine is to cut—he does this by way of data on punched tape or cards—and the machine proceeds to produce the work automatically with little need for human intervention.

Further back in the design chain, newly developed electronic draughting machines are also rapidly gaining acceptance. Production of, for example, a radar system may require as many as 20,000 detail drawings, which such a machine, suitably programmed, can produce on command from basic master sketches.

Initially the master is produced from data typed into the machine while other parts of the sketch are drawn in using a light pen controlled by the "draughtsman". Amendments can also be



Designer in dialogue with computer. A senior designer is shown adding another stage to the MOS microcircuit which he is designing in co-operation with a Myriad computer. He is using a light pen to put a new section into the main circuit design, having called it from the computer store using the keyboard. (*Marconi*)

made via the light pen and the drawings can thus be amended and up-dated when necessary.

Similar computer based design techniques are used in the production of large scale computer systems themselves where the back wiring diagrams are both devised and produced by computers: the same is true of the printed circuit boards on which the components and individual microcircuits are housed. The computer can lay out these boards in an optimum way and what was once a very tedious and time consuming human operation has now been reduced to a straightforward programming exercise.

COMPUTER AIDED DESIGN

Computer aided draughting to which we have just referred should not be confused with "Computer Aided Design" (C.A.D.), which is attracting

excited interest in all branches of the engineering industry.

In the electronics field, circuit diagrams and systems specifications can be fed into a computer which will in turn calculate all the component values to meet the specification. Before the electronic system is actually built, the machine will simulate any design arrived at, see if it is perfect and in some cases can even lay out the various masks needed to produce microcircuits of which the system will ultimately be built.

Clearly techniques of this kind are unnecessary with simple circuits and systems such as the amateur would need to deal with, but the complexity of many of the things the professional electronic engineer is now called upon to produce is such that only with aids of this kind can he complete his assignment in a realistically short time—if at all.

Present limitations of C.A.D. depend mainly upon the size of the computer needed to deal with really ambitious systems, and on the ability of those engaged in semiconductor device research to produce suitable "models" of their device behaviour from which the computer can work. Such limitations apart, however, it is in principle possible for the computer to design an electronic system right from the initial circuit diagram through to the digital information which will control the making of the masks used to produce the component microcircuits of which the system will ultimately be built. Many of these processes are still in the research stage, but the days of at least partly automated circuit production are rapidly drawing nearer.

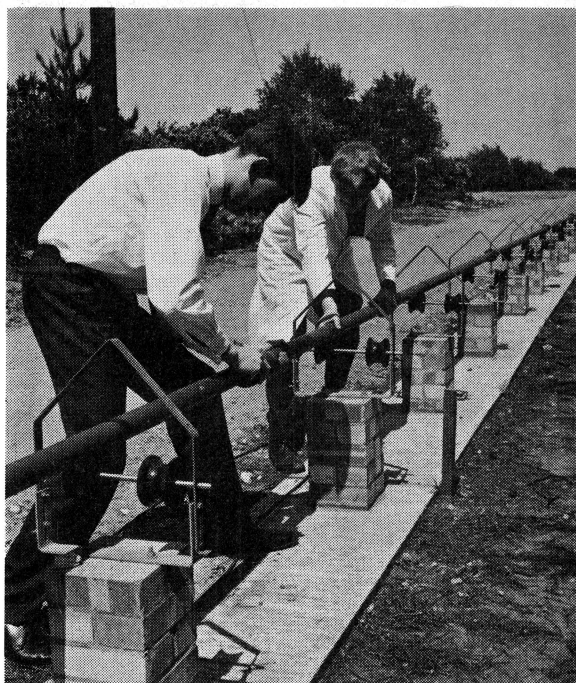
In other fields of engineering, C.A.D. techniques are used to produce minimum cost systems, for example, in an electricity supply system optimum sizes and kinds of components can be chosen by the computer, using linear programming techniques, to perform within given safety factors any specified function.

MODERN COMMUNICATIONS

In communications, with the advance of digital techniques, (for example, pulse code modulation) microelectronics has again found a natural home and the electronic telephone exchanges of the future will be realised in very different form from those currently installed, as increasing degrees of circuit integration are incorporated.

Problems of signal storage still remain, though acoustic techniques, ferromagnetic bubble storage and more particularly the recent improvements in M.O.S. technology offer hopes of early progress on this front too.

In the field of signal transmission, waveguide techniques have now been developed to the point where they offer advantages in some situations over cable or microwave links. Indeed the Post Office is currently installing a 16 kilometre experimental run of multimode helical waveguide, which is due to be incorporated into



This 50mm helical waveguide, seen at the Post Office research station Martlesham Heath, can carry several millions of voice channels (The Post Office)

regular communications use in 1973.

A single 50mm helical waveguide can accommodate several millions of voice channels and though these techniques have been in prospect for several decades, it is only recently that the major difficulties have been resolved and the system has become economic. Trunk waveguide systems may well form the future transmission medium on some of the world's busiest communication routes, for the bandwidth available to us for free space microlinks is rapidly being used up.

Until recently, even given that the waveguide system itself had presented no problems, the terminal equipment to decode the signals and separate the individual channels would have been formidably complicated, without the electronic sophistication available to us today.

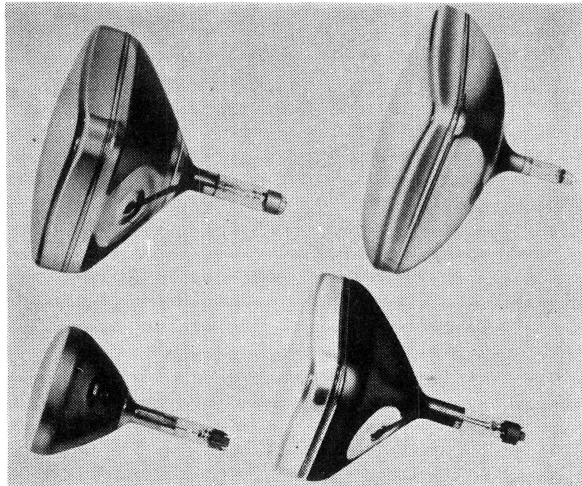
OPTO-ELECTRONICS

What else is in store? We are steadily approaching a new age in which light producing devices offer increasing possibilities as a means of conveying information. New electronic light sources and detectors together with low-loss optical fibres enable us to conduct light round corners and such techniques on a small scale enable the surgeon, for example, to investigate the interior of his patient using illuminated mirrors at the end of a fibre light guide.

In years to come fibres could well serve as a

long- as well as a short-distance communication medium offering even greater bandwidth than that which is offered by the waveguide techniques mentioned previously.

We have seen already that there is good reason to dispense with devices depending upon free electrons (as in the old thermionic valves) wherever possible in favour of solid state devices. There are two areas where we have not succeeded; one is in the design of high power



Development of television picture tubes since 1945: (lower left) 9in., 14.6in. front to back; (lower right) 14in., 16.6in., (top left) 17in., 15.6in; (top right) 19in., 12in. (Mullard)



The television screen of the future? A new type of display panel using a special "liquid crystal" material is currently under development. Words or other information appear on it when a low voltage is supplied by wires which are concealed in this photograph. Immediate practical uses are likely to be data readouts for control panels, animated labelling for keyboards, and see-through map displays which pilots and drivers can read "head-up" without losing sight of the view ahead. One day, "liquid crystals" might provide television screens thin enough to hang on a wall (Marconi)

transmitting valves where the electron tube still reigns supreme; the other is in the display field where the cathode ray tube also remains unchallenged.

Yet, once again much research is directed towards finding solid state replacements for these devices, enabling us prospectively to get rid of high voltages, hot cathodes and relatively short lifetimes. The day of the all solid state camera tube and the solid state display cannot be far away!

RETROSPECT

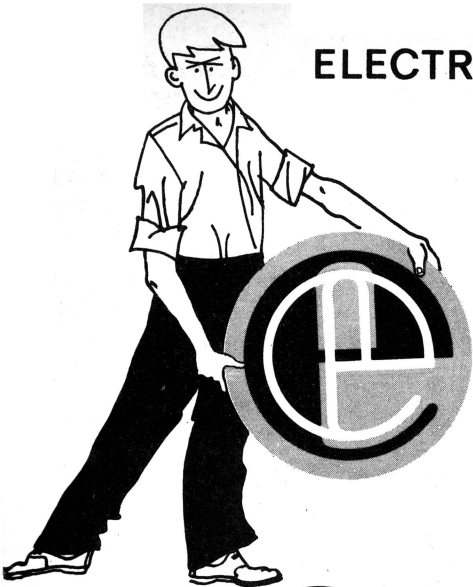
The pace of this advance has been breathtaking and the rapidity with which we have accommodated it equally so. We take for granted already the computers which process our bank cheques, we take for granted the information which is transmitted back to earth from weather satellites and indeed the fact that we can now receive television pictures from, for example, Japan whereas at one time the only way of doing this was to send a film round the world by aircraft.

We take for granted the safety of the navigational systems in the aircraft in which we fly, that the radio altimeter will tell the pilot the correct height when he is coming in to land, or indeed, even more so, that the automatic landing system will handle the aircraft and not miscalculate the point at which it is supposed to meet the ground! We fail to notice the increasing reliability of our telephone system, of which we are perhaps even less conscious when things go wrong!

All of these developments have occurred within the last fifty years, some within the last fifteen, and because of them and more particularly through our television sets we all know far more about the other countries of the world and their peoples than previous generations could have dreamed of. We have all become accustomed to, and indeed have come to expect, ease of communication and travel in all senses. The social effects of these developments all due to electronics have already been immense even if their source has not always been generally recognised.

It may be, as some have suggested, that the era of rapid developments in electronics is now passing and that as we move into the future the progress will be less spectacular. Past experience teaches one to treat such predictions with caution—though, true or not, we may be assured that the demand for electronics equipment and the need for people who understand how to design it will continue.

With the development of simple, easy to use circuits more and more people will find in electronics a diverting pastime which they can put to useful purposes. The main developments may be behind us but the future nevertheless remains tremendously exciting! □



ELECTRONIC CIRCUITS - IN THEORY and PRACTICE

TEACH-IN ... FOR BEGINNERS

By Mike Hughes M.A.

2

ELECTRIC CURRENT

THE trouble with an electric current is that you cannot see it. Perhaps this simple fact is the main reason why a mystique has built up about electronics. Once you have a grasp of what causes an electric current to flow then a lot of basic electronics can be understood right away.

CURRENT FLOW

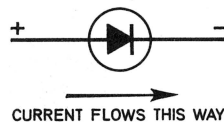
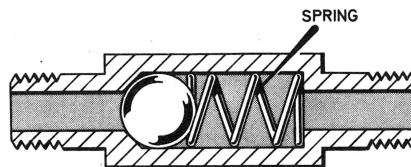
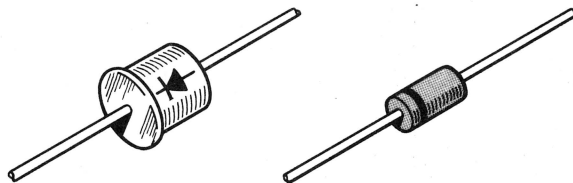
We all take for granted that we can connect a bulb to a battery and make the bulb light up—this is because an electric current flows through the bulb.

How can we prove that current is “flowing”? To have a flow we must pre-suppose that the flow is in one direction only, like a stream. We can show that there is a directional property to current flow very simply but we will need three components: a 9 volt battery, a 9 volt bulb in a lamp holder, and an electronic component called a diode.

We shall be talking about diodes later so at this stage let us consider it simply as a one way valve to the flow of electric current. If you wish to buy a diode capable of doing this experiment you should ask for one having a forward current of 1 amp and a working voltage of at least 12 volts. There are many types to choose from—perhaps the most common having type numbers 1N4001, 1N4002, 1N4003, 1N4004 (the 1N4001 should be the cheapest because it has the lowest working voltage). Fig. 1 shows the appearance of some common diodes that will do. Note there are two wires and either an arrow shaped symbol pointing along the device or a spot or band around one end.

The 1N4001 has a band which corresponds to the end to which the arrow symbol is pointing. This arrow is pointing in the direction along which the diode will allow electric current to flow.

Fig. 1. Two common diode encapsulations are shown above a ball-valve which represents a diode. Water can flow from left to right but not from right to left, likewise a diode allows electric current to flow only in the direction of the arrow in the symbol (shown below the ball valve). This assumes that current flows from positive to negative.



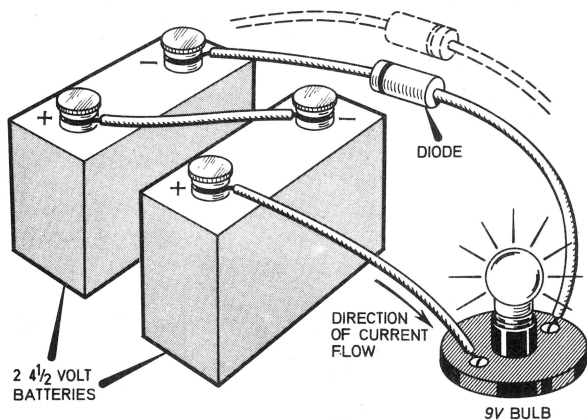


Fig. 2. The bulb lights with the diode connected as shown but will not light if the diode is reversed as in the broken line drawing.

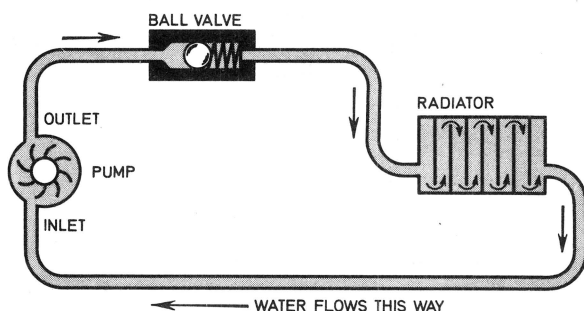


Fig. 3. Water analogy of Fig. 2.

Connect the lamp to the battery with two wires and see that the lamp lights. Reverse the leads to the battery: the lamp still lights. Now put the diode in the circuit. Connect the banded end of the diode (arrow head end) to the *negative* terminal of the battery; the other end to the bulb; the other side of the bulb to the *positive* terminal (we say that the battery, bulb and diode are connected in series). The lamp lights again. Now reverse the diode in the circuit so that the banded end is pointing towards the bulb. The lamp does not light because the diode does not allow current to flow through it this way round (Fig. 2).

By referring to the way the diode was connected in the circuit we can decide which way the current was flowing. It was, in fact, from the positive terminal through the bulb and diode into the negative terminal. This simple circuit has a nice analogy if we consider water as electricity, a pump as our battery (producing pressure) a spring loaded ball valve as our diode, and a radiator as the lamp (Fig. 3).

DEFINITION

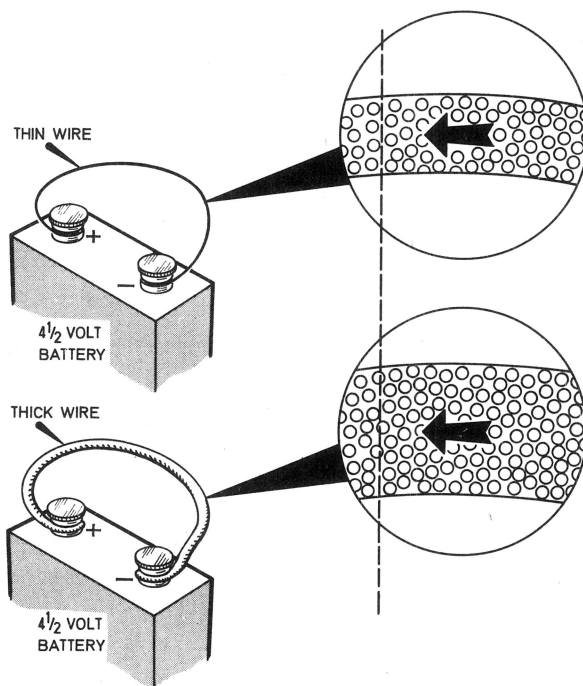
We shall return to this analogy shortly but first let us simply describe what constitutes an electric current. It is quite simply the transfer

of energy from one place to another, the energy being transmitted by the movement of minute particles of matter called electrons. These electrons have a negative charge and like north and south poles of a magnet the negatively charged electrons are attracted to positive potential (voltage)—they are repelled by a negative voltage.

Every material has a number of free electrons within it; copper has a great many and hence is capable of carrying more electric current (for a given cross section) than most other materials—we call it a good conductor. Glass has very few free electrons and hence we call it a bad conductor (or an insulator).

If a piece of copper wire connects the positive terminal to the negative terminal of our battery (do not do this in practice because you will run the battery down) we can imagine the free electrons in the copper moving from the negative terminal to the positive. Note that here is an ambiguity; although electrons move from negative to positive we say (by definition passed down through the ages) that current flows from positive to negative. This sounds confusing but does not usually cause many headaches and because it is such a ridiculous ambiguity it is easy to remember. Unfortunately the definition cannot be changed easily because all the rules of electromagnetism are based on it. During the series we will always assume that conventional current flows from positive to negative.

Fig. 4. More electrons move pass the dotted line per second with a thick wire than do with a thin wire.



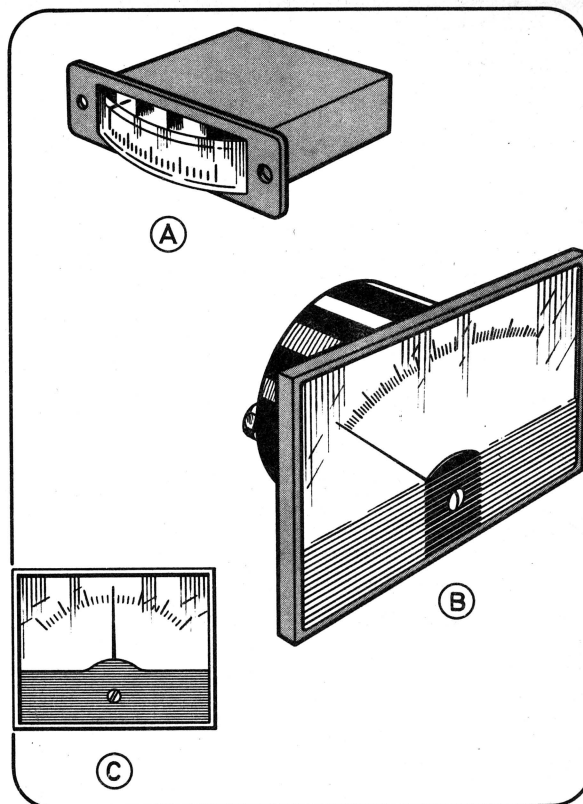
If we had a thick piece of copper wire we would expect more electrons to move past a given point per unit of time than with a thin piece (Fig. 4). Likewise if our battery had a higher voltage it would seem logical that we would get the same sort of effect. This is exactly what does happen. We call the rate of movement (flow) of electrons the **electric current**, the battery voltage is the pressure or motive force driving them, we call this the **electro motive force** (e.m.f. for short) and the copper wire is the conductor which has the ability of allowing large numbers or small numbers of electrons to move depending on its area of cross section; we call this the **resistance** to flow.

WATER ANALOGY

Having defined the basic elements of a real electric current let us now return to our analogy with water. We have already used the terms pressure and flow. We can demonstrate electrical resistance by having a water pipe of small bore connected in series with a pump—similar to a domestic central heating system. The smaller the bore, or the more radiators we have, the higher the pressure we need from our pump to maintain the flow.

It is common practice to measure water pressures relative to a given "head" of water. At the inlet of the pump the pressure is zero because this is our reference point. At the outlet the pressure will be high and positive and in between the various radiators we will still measure positive pressures but they will get less and less as we go round the circuit (Fig. 5).

If we took the junction of radiators B and C as our reference we would measure positive pressures on the "upstream" side of the point and negative pressures on the "downstream" side. What we are in fact measuring is the "pressure difference" between two points. If we have a high resistance to flow between two points we will get a corresponding high pressure difference. This is exactly what happens with an electric current. Let us replace the pump with a battery and the radiators with electronic components called resistors (Fig. 6.)—these are devices which have been specially designed to restrict the flow of current and have values measured in **ohms**. The drawing on the left shows the components as they would appear in real life but now look at the schematic diagram on the right which uses symbols to represent the components. B1 is the battery, R1, R2, R3, and R4 represent resistors. The voltage (or e.m.f.) of the battery is the driving pressure, say 4 volts. If all the resistors have identical value we can say that relative to the negative terminal of the battery the potential at the junctions of R1 and R2 is +3 volts, between R2 and R3 is +2 volts and between R3 and R4 is +1 volt.

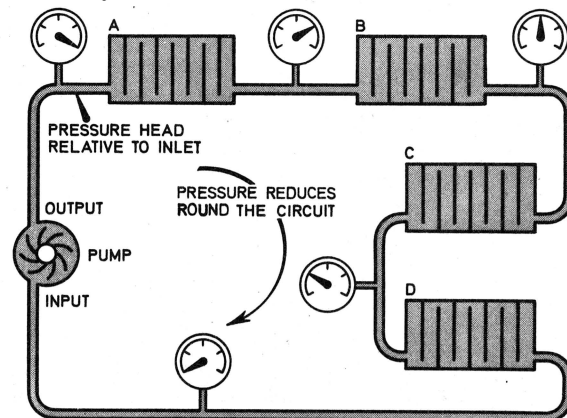


Three types of moving coil meters. A. Edge wise type. B. The "standard" type used in the Demo Deck. C. Centre zero type.

MEASURING CURRENT

It is all very well talking about currents and potential differences but how do we measure them? We have seen that a current flowing through a resistor produces a potential difference. Similarly an e.m.f. across a resistor will produce a current. There is a relationship between these, therefore we should be able to measure potential difference in terms of current. This will be covered in more detail later.

Fig. 5. Water analogy of a circuit showing difference in pressures.



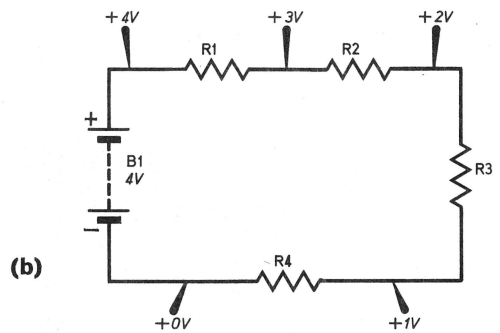
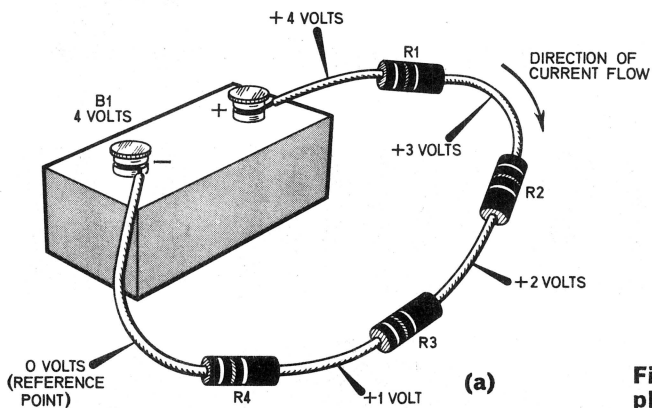
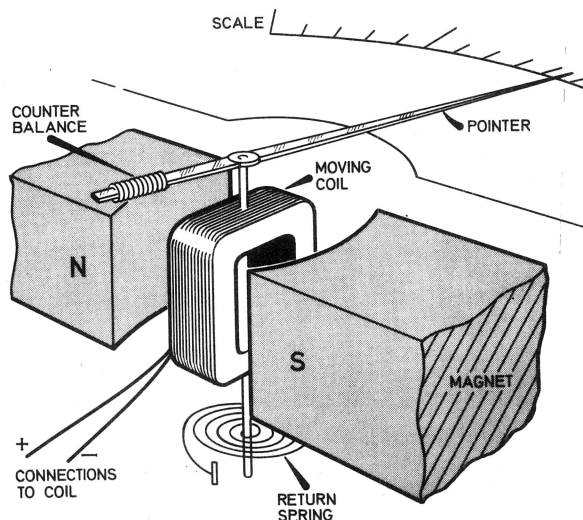


Fig. 6(a). The electronic components that replace Fig. 5. **(b).** The electronic Circuit diagram.

Most instruments in their basic form measure current and are modified to use the relationship mentioned to measure potential difference (voltage). The most common type in use today is the moving coil galvanometer. A small electric current made to pass through a coil of wire pivoted in a strong magnetic field makes the coil move on its pivot against the action of a spring (Fig. 7). A fine pointer attached to the coil moves over a graduated scale calibrated in units of current (amp or fractions of an amp).

Moving coil meters are specified in terms of their sensitivity. For example those used in cars do not have to be very sensitive as the currents measured are very high (10-20 amp) and the coil is usually only a turn or two of very heavy wire. In electronics we are usually concerned with minute electric currents in the order of thousandths or even millionths of an amp and it is quite common to have a meter having a full scale deflection of 100 millionths of an amp (100 microamp). The wire used for the coil in this case is extremely fine and there are many turns. The price of meters is directly proportional to

Fig. 7. Basis of the movement of a moving coil galvanometer.



their size and sensitivity; obviously it is not sensible to buy something that is too good for an application but when obtaining a meter it is always better to err on the side of higher sensitivity—it can always be reduced.

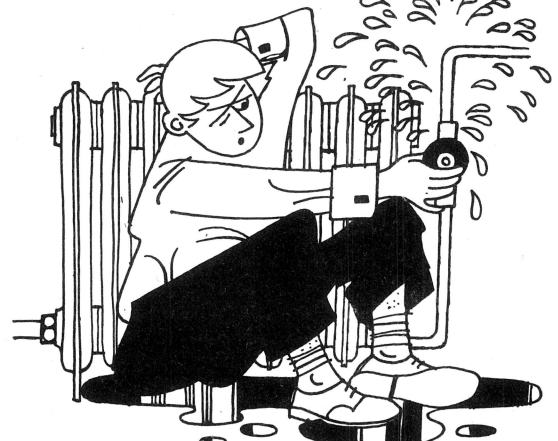
Next month we shall go into more detail about the relationship between current, potential difference and resistance and will carry out some simple experiments. In preparation for this it is suggested that this month you make the *Demo Deck*. This "table top laboratory" will be used frequently during the series and for those with a limited amount of working space it should permit work on the dining room table without too many severe repercussions!

You might be tempted to start experimenting with the *Demo Deck* at this stage; if you are, be extremely careful that you do not pass excessive current through the meter. If you do not understand what this means it is safer to leave things as they are until next month when we shall be putting the deck through its paces, using a few extra components.

The electronic components required are:

2 1,000ohm $\pm 10\%$ $\frac{1}{4}$ watt resistors, 2 10,000 ohm $\pm 10\%$ $\frac{1}{4}$ watt resistors and 2 22,000ohm $\pm 10\%$ $\frac{1}{4}$ watt resistors

Next month: Ohm's law explained and used to make a volt meter on the Demo Deck



Exclusive money-saving offer to our readers



BEGINNER'S TOOL KIT

for only
£1.97



- **BIB WIRE STRIPPERS & CUTTERS**
- **TAPERED NOSE PLIERS**
- **INSULATED SIDE CUTTERS**
- **STEADFAST 4" ELECTRICIANS SCREWDRIVER**
- **STEADFAST 3" INSULATED ELECTRICIANS SCREWDRIVER**
- **TUBE MULTICORE SOLDER IN DISPENSER**
- **All in a black PVC WALLET, with pockets and press stud fastenings**

This valuable set of tools contains the items we described in "Teach-In" for beginners last month as being essential to anyone setting out to enjoy the hobby of electronics. Having the right tools makes the job that much easier to do.

Take advantage of this great offer, exclusive to readers of "Everyday Electronics". Send for your Beginner's Tool Kit today.

HOW TO ORDER

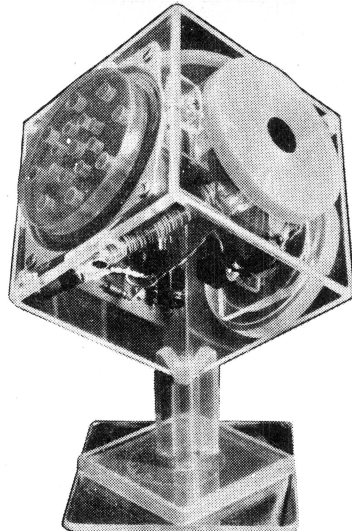
1. Supplies are limited and we advise readers to send in early for this offer to avoid possible disappointment. If there is a heavy demand there may be a delay of 2-3 weeks before the kit is despatched; and should the demand prove exceptionally heavy our supplies may be exhausted before the closing date of 31st December, 1971.
2. Please fill in both Address Sections 1 and 2 of the Order Coupon, in ink, with your name and address in **BLOCK CAPITALS**. We regret that we cannot supply kits to readers who send in a remittance without completing the Order Coupon.
3. This Offer is available only to readers in Great Britain and Northern Ireland.
4. Please do not enclose any correspondence with your Order Coupon, and remittance.
5. Cheques and postal orders to be crossed 'S Co.', made payable to IPC Magazines Limited, (please write your name and address on the back of cheque) and sent to: **EVERYDAY ELECTRONICS TOOL KIT OFFER, 136 Long Acre, London WC99 9YB**

PLEASE FILL IN
BOTH ADDRESS
SECTIONS 1 AND 2
WITH YOUR NAME
AND ADDRESS IN
BLOCK CAPITALS

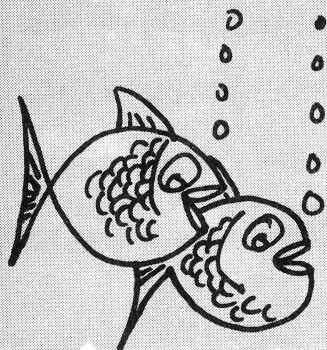
ADDRESS SECTION 1. (Please cut round dotted line)		ADDRESS SECTION 2.
EVERYDAY ELECTRONICS TOOL KIT OFFER		T.K.
Number		Name
I enclose P.O./Cheque		Address
Value
Please send me Kit(s) at £1.97 Each	
Name
Address
.....	
E.E.12.71	
		If undelivered please return to :-
		EVERYDAY ELECTRONICS Offers Dept.,
		136 Long Acre
		London, WC99 9YB. E.E.12.71

CLEARLY

YOU WILL WISH TO BUILD THE
Astron M.W. RECEIVER

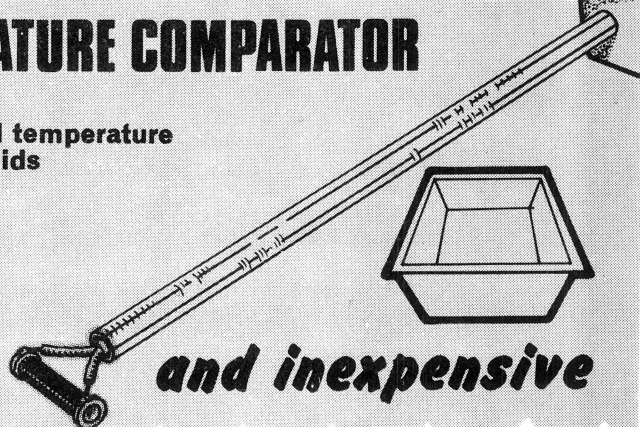


..AND THE REMOTE TEMPERATURE COMPARATOR



Measures small temperature
changes in liquids

...simple



and inexpensive

ELECTRONICS AND THE MUSIC SCENE

Describes the way in which electronics has changed the "musical sound" in recent years and the devices that produce the "special effects" now in common use

*Some of the fascinating
features to be found
in the
JAN '72
issue of*

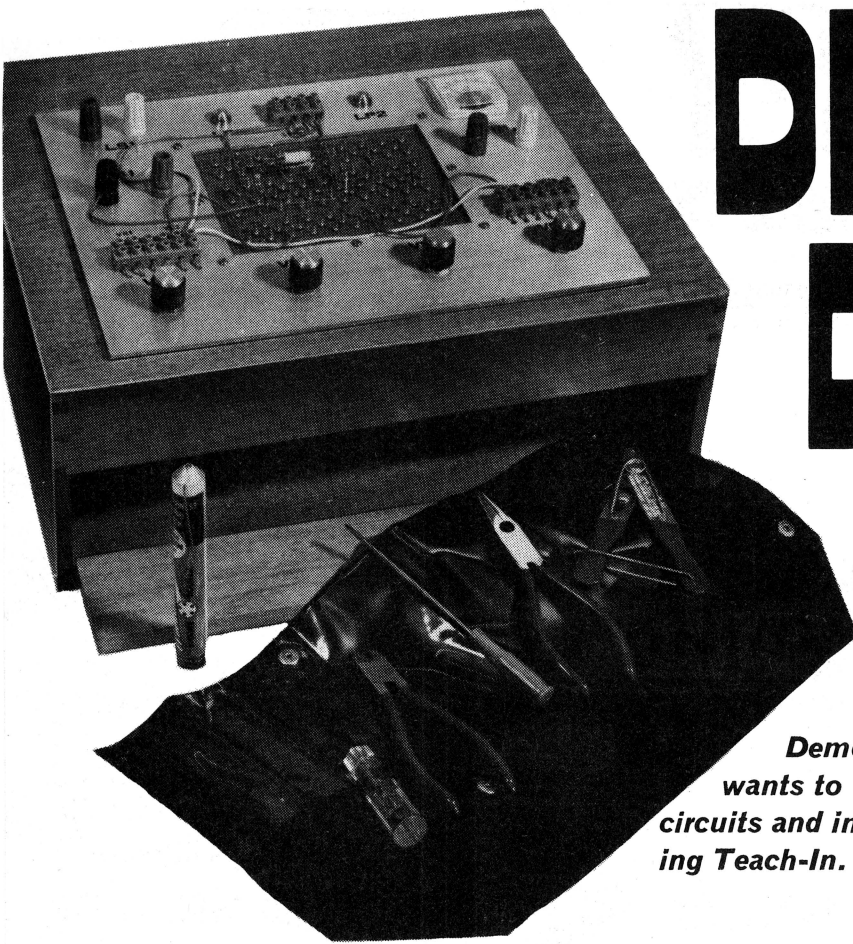


ON SALE

FRIDAY, DECEMBER 17

TEACH-IN PART 3

Explains fully the resistor colour code. Various experiments are carried out using the Demo Deck in which Ohm's law is verified



DEMO DECK

By Mike Hughes M.A.

Demo Deck for everyone who wants to experiment with electronic circuits and in particular for those following Teach-In.

THE Demo Deck has been designed for the constructor who wishes to carry out simple experimental work with the minimum amount of space utilisation, and who desires also the possibility of re-using components several times over. Most particularly it is used as the work horse of the *Teach-In* series and those readers who are following this in a practical sense are strongly advised to make a Demo Deck so that they can perform the exercises and experiments exactly as described.

THE DECK

The deck itself has no circuit diagram but is a flat bed on which is mounted a range of components, together with a sturdy re-usable soldering board. An important feature of the deck for those with limited space is the special cabinet.

The deck is mounted on a specially designed cabinet, this provides accommodation for tools and components and also housing for the loud-speaker and batteries. Thus at the end of experimental work everything can be tidied away neatly and the unit itself—if built well—is quite attractive in appearance.

No doubt it will be repeated in *Teach-In*, but

it is important in any hobby that care is taken—you are your own master but you should set yourself high standards for workmanship and never settle for something that you think you could possibly do better. This is an attitude that should always be taken in electronics because most problems ultimately boil down to untidy or slipshod workmanship. Make as good a job of this table top laboratory as possible; remember you will be using it as a tool for the rest of this series and probably much longer.

There is no need to follow the details exactly, but those following *Teach-In* are advised not to deviate too far from the published design. Some more advanced constructors may like to use the basic design suitably modified to their own purposes. For the benefit of beginners we shall

Approximate cost of components

£5.50 plus cabinet

Potentiometers

- VR1 100 ohm wirewound
- VR2 5,000 ohm (5 kilohm) carbon
- VR3 25,000 ohm (25 kilohm) carbon
- VR4 500,000 ohm (500 kilohm) carbon

Lamps

- LP1 6 volt 0.06 amp MES bulb and holder
- LP2 6 volt 0.06 amp MES bulb and holder

Loudspeaker

- LS1 35 ohm $3\frac{3}{8}$ inch diameter (R.S. Components)

Meter

- ME1 1 milliamp full scale deflection moving coil meter with $1\frac{1}{2}$ inch square face (S.E.W. type MR38P)

Battery

- B1 $4\frac{1}{2}$ volt screw terminal bell battery (2 off)

Miscellaneous

- 1 small perforated board (R.S. Components)
- 1 gross box small turret tags (R.S. Components)
- 2 ten way 2 amp terminal blocks (R.S. Components Barrier Strip 2A)
- 6 Slim screw terminals, different colours (R.S. Components)
- Banana plugs to fit screw terminals (optional accessory)—if alternative terminals are used these may not have facility for plugs
- Small or medium crocodile clips (optional accessory)
- 2 yards (approx.) single strand insulated connecting wire
- 2 yards (approx.) light duty twin flex (for leads to B1 and LS1)
- 2 yards (approx.) seven strand insulated connecting wire (for connecting leads)
- Aluminium or other material for chassis (see text)
- Wood for housing (see Fig. 5). Lettering sheet. Varnish etc.

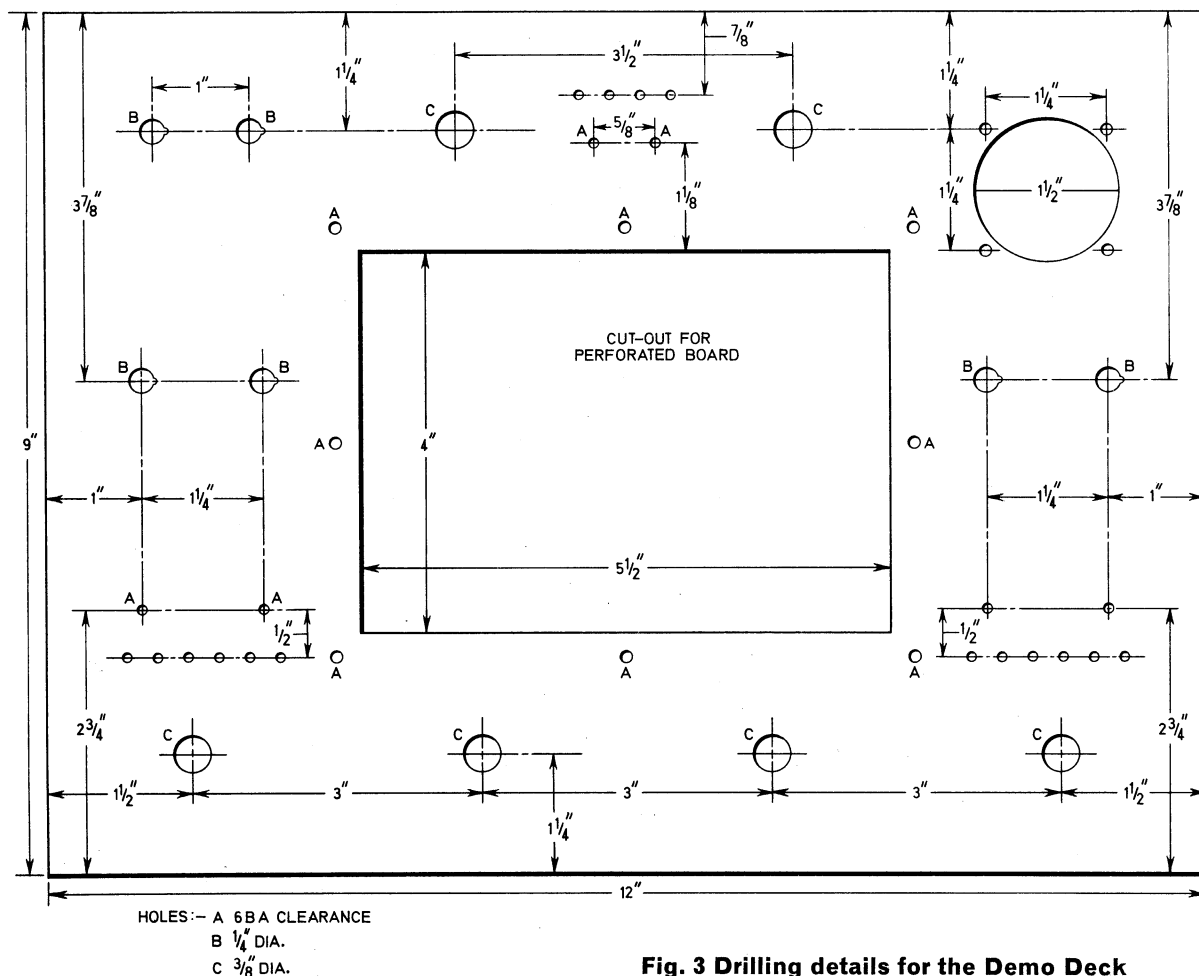


Fig. 3 Drilling details for the Demo Deck

the layout drawing (Fig. 3). It is as well to check the diameter of fixing holes because some components of different manufacture can vary in physical dimensions.

Check that the potentiometers, lamp holders, terminals and meter will fix correctly and then finish off the surface of the Demo Deck. If aluminium is used, make a satin finish by scrubbing the surface in a horizontal direction with fine grade wire wool; lightly dust off the metallic powder produced without getting finger marks on the surface and immediately apply a coat of polyurethane varnish. When dry apply lettering either with transfers or Letraset and then give a final protection coat of varnish. If you have used a wooden surface apply one or two coats of a hard gloss paint and when dry carry out the lettering as above. Finish off with a coat of clear varnish. Each tag should be identified by a number/letter code and this can be applied to the chassis around the edge of the board. The designations are applied as shown in Fig. 1.

WIRING

Now is the time to mount permanently all the components. Take care when handling the 1 milliamp meter and make sure that you have the potentiometers mounted in the right places. If necessary cut the shafts of the potentiometers, to take the knobs, before mounting on the deck. The values of resistance are printed on the side of the potentiometer cans. The underside wiring is only to route the terminals of the components to the Demo Deck terminals

and Fig. 4 shows the details. Take note that there is a cross-over in the wiring sense of the potentiometer terminals and ensure that the polarity of the meter is correct. All meters should have the positive terminal marked + or with a red spot of paint. Leave the flying leads from the battery and loudspeaker terminals about 18 inches long: these will be connected to the components mounted in the wooden cabinet.

Set the deck aside and make a suitable support. It is recommended that a cabinet similar to that described in Fig. 5 be made. This will hold the batteries and loudspeaker, as well as having a compartment for tools and small extra components. Fig. 5 shows an exploded view of the prototype design. Make sure that you leave sufficient room to gain access to the batteries and that the rear of the loudspeaker is protected.

All that remains to be done is to make up some accessory leads. It is suggested that you keep an assortment of single ended and double ended crocodile clip leads and two or three single ended banana plug leads. These will be extremely useful for experimentation and can save a lot of frustrating time wasting.

There is only one word which need be said about the use of the deck. While the tag posts can be re-soldered many times it is worthwhile attempting to use the minimum amount of solder otherwise there will be a tendency to build up a large "blob" which can be annoying and ultimately make further soldering difficult. Should the wiring panel reach a condition when it can no longer be used it can be replaced simply by undoing the eight screws and dropping it out. ▣

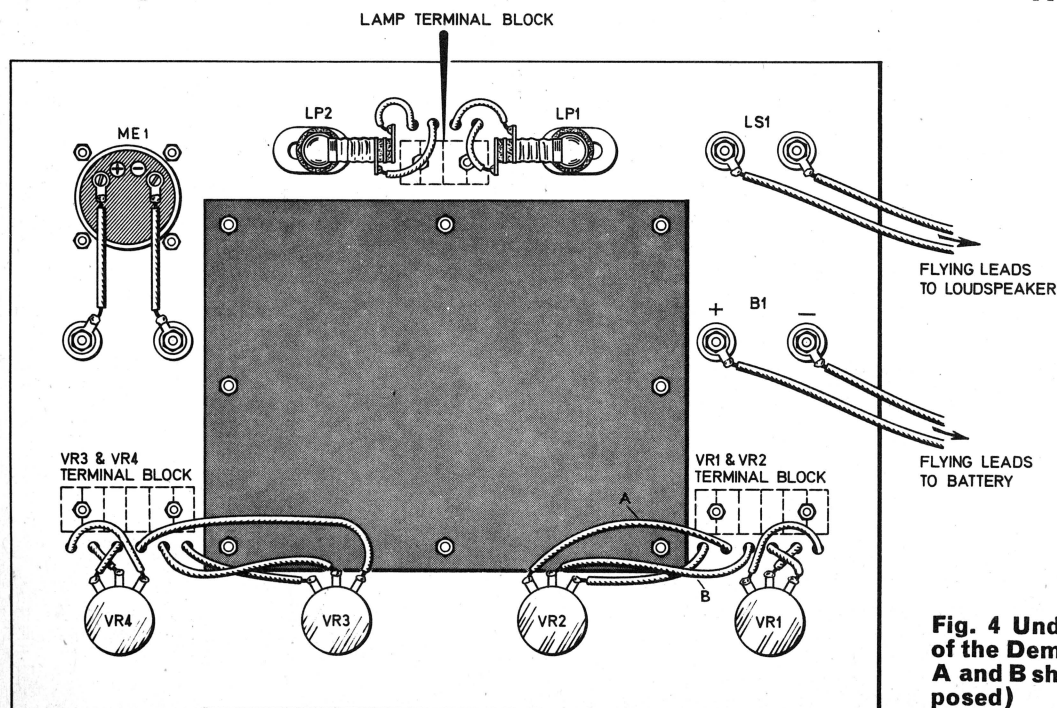


Fig. 4 Underside wiring of the Demo Deck (wires A and B should be transposed)

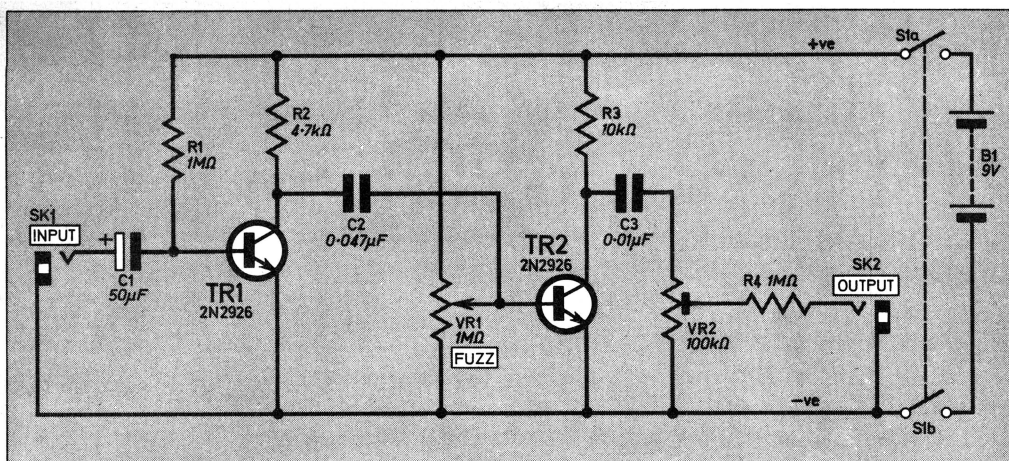


Fig. 1. The circuit diagram of the fuzz box.

flying leads on the board as shown, taking special care when soldering the transistors. It is recommended that a heat shunt be used, such as a pair of pliers gripping the transistor lead being soldered. This conducts away the heat from the soldering iron which would otherwise damage the transistor.

Some form of insulation should be placed between the Veroboard and the lid to ensure there is no "shorting" of the rear of the Veroboard by the metal lid. A piece of insulation tape stuck to the lid, under the Veroboard, is sufficient to prevent this.

CASE CONSTRUCTION

The size, shape and material of the case may be tailor-made to individual requirements, but the one shown in the photograph and described here was, besides having a neat appearance, found to be easy to construct and readily able to house all the components in a neat and tidy fashion.

The prototype case was made from 1/16in. thick aluminium sheet to the dimensions given in Fig. 3.

All holes should be drilled before the metal is bent to shape.

The holes for fixing SK1, SK2, and VR1 will require large drill bits, up to 1/2in. diameter. If these are not available, a smaller hole should be drilled first and then filed with a circular file until the correct size is obtained.

The slot for accommodating the slide on-off switch is easiest made using the "drill and file" method. That is, drill holes at the extremes of the rectangular area to be removed and then straighten up the perimeter with a small file.

The lid, which forms the base, is made from the same material as the body of the case and should have a 1/4in. lip to enable attachment to the body by means of 2 small self-tapping screws.

The case is now ready for assembly.

ASSEMBLY

Fix SK1, SK2, VR1 and S1 firmly in their positions in the case as shown in Fig. 4, and then wire them to the Veroboard. The length of all these wires should be about 5 to 6 inches.

Screened cable must be used for the connections between SK1, SK2 and the Veroboard. This eliminates interference.

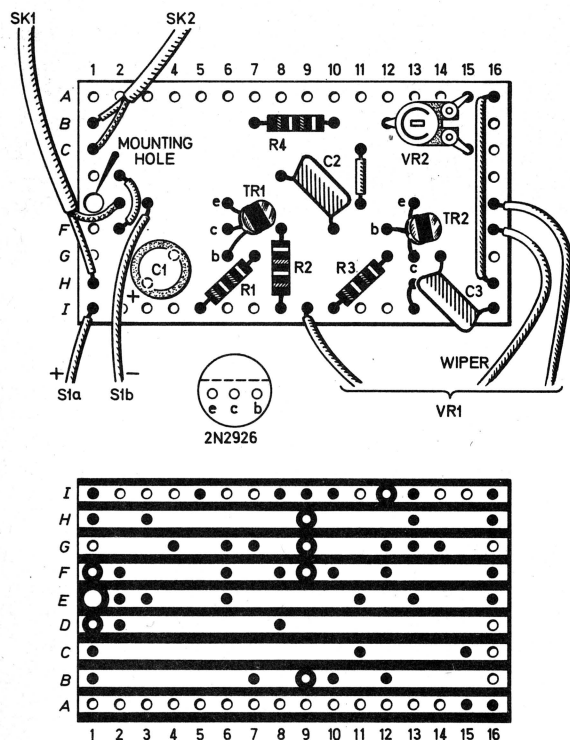


Fig. 2. The layout of the components on the top side and underside of the veroboard. Note that the flying leads to SK1 and SK2 are of screened cable. The transistor base connections as viewed from underneath are shown below. The larger drilled hole at E1 is for mounting purposes.

ANTEX

the soldering appliance specialists



CN.240/2 Miniature soldering iron 15 watt 240 volts, fitted with nickel plated 3/32" bit and packed in transparent display box. Also available for 220 volts. **Price £1.70**

CN.240 Miniature soldering iron 15 watt 240 volts, fitted with iron coated 3/32" bit. Up to 18 interchangeable spare bits obtainable. This iron can also be supplied for 220, 110, 50 or 24 volts. **Price £1.70** (Supplied in standard pack)

G.240 Miniature soldering iron 18 watt 240 volts extensively used by H.M. Forces. Suitable for high speed soldering and fitted with iron coated 3/32" bit. Also available for 220 volts. Spare bits 1/8", 3/16" and 1/4" are obtainable. **Price £1.83** (Supplied in standard pack)



CCN.240 New model 15 watt 240 volts miniature soldering iron with ceramic shaft to ensure perfect insulation (4,000 v A.C.). Will solder live transistors in perfect safety, fitted with 3/32" iron coated bit. Spare bits 1/8", 3/16" and 1/4" available. Can also be supplied for 220 volts. **Price £1.80**

CCN.240/7 The same soldering iron fitted with our new 7-star high efficiency bit for very high speed soldering. The bits are iron coated, nickel and chromium plated. **Price £1.95**



E.240 20 watt 240 volts soldering iron fitted with 1/4" iron coated bit. Spare bits 3/32", 1/8" and 3/16" available. Can also be supplied for 220 and 110 volts. **Price £1.80.**

ES.240 25 watt 240 volts soldering iron fitted with 1/8" iron coated bit and packed in a transparent display box. Spare bits 3/32", 3/16" and 1/4" available. Can also be supplied for 220 and 110 volts. **Price £1.83**



SK. 1 SOLDERING KIT

The kit contains a 15 watt 240 volts soldering iron fitted with a 3/16" bit, nickel plated spare bits of 5/32" and 3/32", a reel of solder, heat sink, cleaning pad, stand and booklet "How to Solder." Also available for 220 volts.

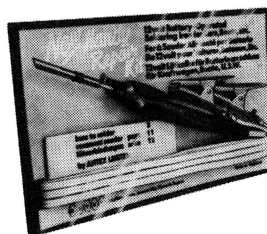
Price £2.75



SK. 2 SOLDERING KIT

This kit contains a 15 watt 240 volts soldering iron fitted with a 3/16" bit, nickel plated spare bits of 5/32" and 3/32", a reel of solder, Heat Sink, 1 amp fuse and booklet "How to Solder"

Price £2.40.



MES. 12

A battery operated 12 volts 25 watt soldering iron complete with 15' lead, two crocodile clips for connection to car battery and a booklet "How to Solder" packed in a strong plastic wallet.

Price £1.95



from electrical and radio shops or from
Antex Ltd. FREEPOST, (no stamp required) **Plymouth, PL1 1BR.**
Telephone 0752 67377/8

☐ Please send the Antex colour catalogue.

Please send the following:

I enclose cheque/P.O./Cash
(Giro No. 2581000)

Name _____

Address _____

EE.2

Connect the battery terminal as shown in Fig. 4 making sure that the polarity is correct, otherwise damage to the transistors may result.

All that remains to be done is to fix the Vero-board to the lid by means of a small nut and bolt, clip in the battery and secure the lid. The fuzz box is now complete and ready for use.

If required a foot switch may be included in the fuzz box to switch in and out the fuzz effect. Such a switch must be arranged to connect the input to the output (SK1 to SK2) and screened lead should be used to wire up the switch.

USES

The fuzz box is used extensively and mostly by "groups" for lead guitar where it is placed between the guitar and the main amplifier, but it may be employed for effect with almost any instrument, such as bass guitar, electronic organ, and even microphone. Weird and interesting sounds may be obtained by using the fuzz box

in conjunction with a microphone used to amplify musical instruments such as a trumpet and trombone. This device is a must for the musical sound experimenter. □



Ruminations By Sensor

The I.C. man cometh

The reductions in size and production costs and the improvement in reliability of complex electronic systems, brought about by the use of integrated circuits has lead to their incorporation into all kinds of equipment. Apart from the more obvious applications such as computers and kindred equipment, radar, television and communications systems; integrated circuits can now be found in applications as diverse as washing machines, model aircraft control and in fuel injection and ignition systems for motor cars. With these facts in mind, I began to wonder what the future electronic "foreigner" will be like.

Before writing anything else I must hasten to add that I am not going to discuss genetics; a "foreigner", in industrial terms, is a private job carried out on works premises. The foreigner can take many forms, it may be a small repair job which requires facilities not normally available in the home, such as welding or turning, or it may be a complete piece of equipment, designed and built within the works. Foreigners are

usually relatively small in dimensions, or capable of being broken down into small units, so that they can be hidden from authority and eventually smuggled out of the factory.

One thing common to all foreigners is that they seldom reach completion; in the first flush of enthusiasm there is much frenzied activity which is highly infectious. Colleagues will rush to assist with ideas and materials, other departments will lend expertise and facilities, and if these offers of help are not strongly resisted from the outset, the original creator will find that his precious brainchild has been wrenched from his grasp to be broken down into a number of sub projects spread throughout the works.

Further sub-division may then take place and it can be said that the more sub-divisions there are, the less likelihood there is of the project being completed. Also, the rate of working falls off very rapidly after the initial fervour has evaporated—as there are few things more boring than old foreigners, especially other people's foreigners. These rules can be expressed in simplified form as:

$$t_c = F_r U_s T_{rate} + \Sigma I$$

where t_c = time to completion
 F_r = "foreigner receptiveness" (a constant for the factory)

U_s = the number of unit sub-divisions

T_{rate} = the rate of toiling

ΣI = the sum of all the inertia factors of everyone involved (similar rules apply to bona fide jobs but F_r is replaced by a term O representing official support).

But what, you may ask, has all this to do with integrated circuits? Well, integrated circuits are small—one of the essential features of a foreigner; (though I heard that a 60 foot maypole was once built as a foreigner; but that is another story!) they are virtually complete in themselves and often merely require connection to a power supply and some ancillary input or output equipment and they are ready for use. A wide range of timing circuits and audio circuits exists and the versatile operational amplifier lends itself to many projects.

Can we expect to see a flood of baby alarms, exposure timers, model railway controllers and electronic roulette games pouring through the factory gates? I think not, for there is still the problem of the box, case or cabinet. This is where the greatest inertia is traditionally encountered and where $F_r U_s T_{rate}$ approaches infinity. Until we discover how to "grow" boxes around our foreigners, they are doomed to remain what they have always been—memorials to frustrated creativity.

28watts, r.m.s. 40Hz to 40kHz ± 3 dB



Viscount III Audio Suite complete £49

There are two stereo amplifiers—the R100 for ceramic cartridges, the R101 for magnetic and ceramic. Both incorporate FETs (FIELD EFFECT TRANSISTORS), just like top-priced units. FETs give you more of the signal you want, and almost none of the background hiss you don't. Both units have a jack socket to plug in headphones and there's a separate output for tape recorder. Filters (an unusual feature in this price range) and tone controls give a wide range of bass and treble adjustment which compensate for input deficiencies and domestic acoustic conditions.

PRICES SYSTEM 1

Viscount III R101 amplifier	£22.00 + 90p p&p
2 x Duo Type II speakers,	£14.00 + £2 p&p
Garrard SP25 Mk. III with MAG.	
cartridge plinth and cover	£23.00 + £1.50 p&p

Total £59.00

Available complete for only £52.00 + £3.50 p&p

SYSTEM 2

Viscount R101 amplifier	£22.00 + 90p p&p
2 x Duo Type III speakers	£32.00 + £3 p&p
Garrard SP25 Mk. III with MAG.	
cartridge, plinth and cover	£23.00 + £1.50 p&p

Total £77.00

Available complete for £69 + £4 p&p

SYSTEM 3

Viscount III Amplifier R100	£17.00 + 90p p&p
2 x Duo Type II speakers, pair	£14.00 + £2 p&p
Garrard SP25 Mk. III with CER. diamond	
cartridge, plinth and cover	£21.00 + £1.50 p&p

Total £52.00

Available complete for only £49.00 + £3.50 p&p

SPEAKERS Duo Type II

Size approx 17" x 10½" x 6½". Drive unit 13" x 8" with parasitic tweeter. Max. power 10 watts. 3 ohms. Simulated Teak cabinet. £14 pair + £2 p&p.

Duo Type III Size approx 23½" x 11½" x 9½". Drive unit 13½" x 8½" with H.F. speaker. Max. power 20 watts at 3 ohms. Freq. range 20Hz to 20kHz. Teak veneer cabinet. £32 pair + £3 p&p.

SPECIFICATION R101

14 watts per channel into 3 to 4 ohms. Total distortion @ 10V @ 1kHz 0.1%. P.U.1 (for ceramic cartridges) 150mV into 3 Meg. P.U.2 (for magnetic cartridges) 4mV @ 1kHz into 47K, equalised within ± 1 dB R.I.A.A. Radio 150mV into 220K. (Sensitivities given at full power). Tape out facilities; headphone socket, power out 250mW per channel. Tone controls and filter characteristics. Bass: +12dB to -17dB @ 60Hz. Bass filter: 6dB per octave cut. Treble control: treble +12dB to -12dB @ 15kHz. Treble filter: 12dB per octave. Signal to noise ratio: (all controls at max) R101—P.U.1 and radio—65dB. P.U.2. —58dB. R100 same as R101 but P.U.2 (for crystal cartridges) 450mV into 3 Meg. Cross talk better than -35dB on all inputs. Overload characteristics better than 26dB on all inputs. Size approx 13½" x 9" x 3½".

R+TV

Radio and TV Components (Acton) Ltd. 21e High Street, Acton, London W3 6NG
323 Edgware Road, London, W.2. Mail orders to Acton. Terms C.W.O. All enquiries S.A.E.
Goods not despatched outside U.K.

logues in circulation and consequently we shall be receiving too little money for our goods. When the price jump is big, we finish up selling below cost! We must then, either write to you, the customer, asking for more money (which does not help the customer-dealer relationship), or we must lose money.

Many years ago, we took our prices out of our catalogue and put them in a separate supplement as we argued that although we couldn't reprint the catalogue for every price change, at least we could change a price supplement several times a year. Lately, the rapidity of price changes made even this unworkable and we have now installed an Offset Litho Machine to print our own Price Supplements on the spot. Price changes can be made within minutes and at last we are keeping up with them!



... Price changes can be made within minutes

Packing and Postage

One minor problem which I think we have solved fairly well is making a part charge towards the cost of packing and postage. After much thought, we decided to average out the cost of all postage and charge this as a standard rate. At the moment it is 18p per parcel. Naturally the customer who orders some heavy transformers is happy, but the customer who orders 25p worth of resistors less so.

Occasionally a customer might write and say "You charged me 18p for post and packing and I noticed that my 25p worth of resistors were just put in a padded bag with a 3p stamp on it". It is then necessary to point out that our gross profit on the transaction is probably 8p and apart from the bag costing us 3p and the stamp 3p, the staff handling it are earning about 1p per minute! But I must be fair and say we probably receive less than 12 letters a year in this vein. I think even with "cash with

order", that probably all dealers lose money on orders under £1—but again it is a service to the customer. We stress again and again, try and send one big order instead of several small orders, help yourself to save postage and also help us!

Stock Control

Nothing frustrates you, the customer, more than to be told that an item you require is out of stock. You may put this down to bad management and poor stock control. Well, a few years ago, one of the giants in the electronic components industry decided to go into the retail side, and produced magnificent catalogues, spent thousands in advertising and yet after a year or two, it was obviously not going according to plan.

Knowing that we had achieved a very modest success in the business, two of the firms executives came and took my partner and I to lunch and it was apparent they wanted to find out what made us tick! When they got round to stock control, they said "What do you do?" and we said "What do you do?" "Well," they said, "when an order comes in it is fed into the computer. The computer makes out the invoice, types the label, checks the stock, and when the stock falls below a certain predetermined level, re-orders! And now, what do you do?"

"Oh!" we replied, "well if we pick up a box and it's empty, we re-order, if the box is battered and worn out (they are cardboard by the way) we obviously should order bigger quantities, if there is more than a certain predetermined thickness of dust on the box, this item is a slow seller and should be discontinued."

The two executives stared at us in disbelief until we convinced

... more than a certain predetermined thickness of dust



them that we were telling them the truth, and when we pressed them, they admitted they were out of stock of various goods far more often than we were!! We then went on to tell them why—there are too many variables for any computer to cope with, therefore one might just as well do it the simplest way!

Next month I will discuss the influence of magazine constructional articles upon the supply situation.

EVENING ELECTRONICS

Many readers, both newcomers to electronics and experienced hobbyists, may be interested in evening classes or clubs for electronic enthusiasts. There are many evening classes run for both beginners and experienced constructors all over the country and we know that some evening institutes run more than one course. Although these courses will have been going on for more than a month when you read this, most of them will gladly accept newcomers.

If you are interested in joining such a class, we recommend you to get in touch with your local education authority, who can inform you of all the courses in your area. For Londoners the booklet "Floodlight" available from most newsagents gives all the courses being held in the Greater London area.

As well as evening classes there are some electronics clubs operating within the British Isles, the largest of these being the British Amateur Electronics Club. For more information about this club and its activities please write to:

Mr. C. Bogod, The Secretary,
B.A.E.C., 26 Forrest Road,
Penarth, Glamorgan.

EVERYDAY ELECTRONICS may be visiting some evening classes and club activities and reporting on them during the coming months. So if you run or belong to such a group and you feel that you have something interesting to show us or that the arrangement and activities of your group warrant mention, then let us know.

HI-FI EQUIPMENT

SAVE UP TO 33 1/3% OR MORE

SEND S.A.E. FOR DISCOUNT PRICE LISTS AND PACKAGE OFFERS!



RECORD DECKS

B.S.R.		
Mini Mono†	\$4.97	
C129†	\$6.70	
MP60	\$11.75	
C10	\$14.85	
S10	\$11.85	
S10	\$9.95	
MP60 T.P.D.I.	\$17.95	
MP60 T.P.D.2	\$15.85	
10 T.P.D.1	\$20.97	
10 T.P.D.I.	\$18.75	
10 Package*		
H.T.70	\$9.85	
H.T.70 Package	\$15.55	
	\$20.25	
THORENS		
TD125	\$59.95	
TD125AB	\$94.25	
TX25	\$6.70	
TD150AH	\$34.50	
TD150ABII	\$40.55	
TX11	\$3.77	

† Mono * Stereo Cartridge
All other models less Cartridge
Carriage 50p extra any model.

RECORD DECK PACKAGES

Decks supplied ready wired in plinth and cover fitted with cartridge. Garrard 2025 T/C with Sonotone 9TAHCD £15.95
Garrard SP25III Goldring G800 £18.95
Garrard AP76 Goldring G800 £29.95
BREL MF60 Audio Technica AT 35 £21.00
Goldring GL69/2 Goldring G800 £37.50
Goldring GL75 Goldring G800 £42.50
Goldring GL75 Goldring G800 £46.95
Carriage 50p extra any model.

SPECIAL PURCHASE

Brand new 18" 100 watt speakers. Made by Celestion or Fane. 18" 100 watt rms. 35 cps bass resonance. Limited stock only.

Each £13.95 Carr. 50p

SINCLAIR EQUIPMENT

Project 60. Package offers.



2 x Z30 amplifier, stereo 60 pre-amp, PZ5 power supply. £16.75 Carr. 37p. Or with PZ6 power supply £18.85 Carr. 37p. 2 x Z50 amplifier, stereo 60 pre-amp, PZ8 power supply. £20.25 Carr. 37p.
Transformer for PZ8. £8.97 extra.
Add to any of the above £4.87 for active filter unit and £13.90 for pair of Q16 speakers.
Project 60 FM Tuner £20.25. Carr. 37p.
All other Sinclair products in stock.
2000 Amp £23.75 Carr. 37p.; 3000 Amp £31.50 Carr. 37p.; Neoteric Amp £43.95 Carr. 37p.
IC10/IC12 £2.50
NEW PROJECT 605 — £20.97, Carr. 37p.

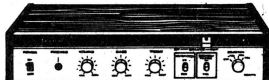
LATEST CATALOGUE

Our new 6th edition gives full details of a comprehensive range of HI-FI EQUIPMENT, COMPONENTS, TEST EQUIPMENT, and COMMUNICATIONS EQUIPMENT. FREE DISCOUNT COUPONS



VALUE 50p 272 pages, fully illustrated and detailing thousands of bargains.
SEND NOW
ONLY 37 1/2 p P & P 10p

TELETON SAQ-206 STEREO AMPLIFIER



Latest exciting release. Brand new model. 6 + 6 watts rms. Inputs for mag, xtal, aux tape. Volume, bass, treble, sliding balance, scratch filter and loudness controls. List £32.50 OUR PRICE £17.50 Carr. 37p.



Probably the most popular budget Tuner/Amp. and now offered at a ridiculous low price. 5 watts r.m.s. per channel. Tape/Cer phono inputs. AFC/Built-in MPX. List £51. OUR PRICE £28.75. Carr. 50p.
★ SUGGESTED SYSTEM
F.2000, Garrard 2025T/C Changer fitted stereo cartridge, with plinth and cover and pair of G.W.S. 3 way Speakers. Total Rec. Price £97.73. OUR PRICE £54.65. Carr. £1.

★ TRANSISTORISED FM TUNER

6 TRANSISTOR HIGH QUALITY TUNER. ONLY 6 x 4 1/2 in. 3 I.F. stages. Double tuned discriminator. Ample output to feed most amplifiers. Operates on 9 V battery. Coverage 88-108Mc/s. Ready built ready for use. Fantastic value for money. £6.37. P. & P. 12p. Stereo multiplex adaptors £4.97.

HA-10 STEREO HEADPHONE AMPLIFIER

All silicon transistor amplifier operates from magnetic, ceramic or tuner inputs with twin stereo headphone outputs and separate volume controls for each channel. Operates from 9v battery. Inputs 5MU/100MU. Output 50MW. £5.97. P. & P. 15p.

NS-1600W STEREO AMPLIFIER

Exceptional budget price amplifier. All silicon transistor. Handsome Walnutcase. Switched input selector. Separate balance, volume, treble, bass controls. Output 2 x 6W RMS. Inputs Mag. Tape, Xtal, Tuner. Tape Out. £14.75. Carr. 37p.

EA-41 REVERBERATION AMPLIFIER

Self contained, transistorised, battery operated. Simply plug in microphone, guitar, etc., and output into your amplifier. Volume control, depth of reverb control. Beautiful walnut cabinet. 7 1/2 x 3 1/2 in. £5.97. P. & P. 15p.

BH-001 HEAD-SET AND BOOM MICROPHONE

Moving coil. Ideal for language teaching, communications. Headphone imp. 16 ohms. Microphone imp. 200 ohms. £4.62. P. & P. 15p.

HOSIDEN DH-085 DE-LUXE STEREO HEADPHONES

Features unique mechanical 2 way units and fitted adjustable level controls. 8 ohm impedance. 20-20,000cps Complete with spring lead & stereo jack plug £7.97. P. & P. 12p.

TO-3 PORTABLE OSCILLOSCOPE

3in. tube. Y amp. Sensitivity 0.1v p-p/CM. Bandwidth 1.5 cps-1.5 MHz. Input imp. 2 meg Ω 25pF X amp. sensitivity 0.9v p-p/CM. Bandwidth 1.5 cps-500KHz. Input imp. 2 meg Ω 20pF. Time base. 5 ranges 10 cps-300 KHz. Synchronization. Internal/external. Illuminated scale 140 x 215 x 330 mm. Weight 15 1/2 lb. 220/240V. A.C. Supplied brand new with handbook. £37.50. Carr. 50p

RUSSIAN C1-16 DOUBLE BEAM OSCILLOSCOPES

5 MHz Pass Band. Separate Y1, Y2 amplifiers. Calibrated triggered sweep from .2 sec to 100 milli sec/cm. Supplied complete with all accessories and instructions £87. Carr. paid.

BELCO AF-5A SOLID STATE SINE SQUARE WAVE C.R. OSCILLATOR

Sine 18-200,000 Hz; Square 18-50,000 Hz. Output max. +10 dB (10 K ohms) Operation internal batteries Attractive 2-tone case 7 1/2 x 5 1/2 x 3 1/2 in. Price £17.50. Carr. 17p.

TE-16A Transistorised Signal Generator. 5 ranges 400KHz-30MHz. An inexpensive instrument for the handyman. Operates on 9v battery. Wide easy to read scale. 800KHz modulation. 5 1/2 x 5 1/2 x 3 1/2 in. Complete with instructions and leads. £7.97. P. & P. 20p.

TE15 TRANSISTORISED GRID DIP METERS
Six ranges. 440 Kc/s-280 Mc/s. Operates on 9v. battery. Full instructions. £12.50. P. & P. 17p.

TE11. DECADE RESISTANCE ATTENUATOR
Variable range 0-111dB. Connections, Unbalanced T and Bridge T. Impedance 600 Ω range (0.1dB x 10) + (1dB x 10) + 10 + 20 + 30 + 40dB. Frequency: d.c. to 200KHz (-3dB). Accuracy: 0.05dB. + Indication dB x 0.01. Maximum input less than 4W (50V). Built in 600 Ω load resistance with internal/external switch. Brand new. £27.50. P. & P. 25p.

230 VOLT A.C. 50 CYCLES RELAYS
Brand new. 3 sets of changeover contacts at 5 amp rating. 50p each. P. & P. 10p (100 lots £40) Quantities available.

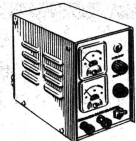
270° Wide Angle 1mA Meters
MW1-6 60mm square £3.97
MW1-8 80mm square £4.97
P. & P. extra

POWER RHEOSTATS

High quality ceramic construction. Windings embedded in vitreous enamel. Heavy duty brush wiper. Continuous rating. Wide range ex-stock. Single hole fixing. 1/4 in. dia. shafts. Bulk quantities available.
25 WATT. 10/25/50/100/250/500/1000/1500/2500 or 5000 ohms. 72p. P. & P. 7p.
50 WATT. 10/25/50/100/250/500/1000/2500 or 5000 ohms. 11.05p. P. & P. 7p.
100 WATT. 1/5/10/25/50/100/250/500/1000 or 2500 ohms. £1.37. P. & P. 7p.

"YAMABISHI" VARIABLE VOLTAGE TRANSFORMERS

Excellent quality. Low price. Immediate delivery
8-2500 General Purpose Bench Mounting
1 Amp £7.00
2.5 Amp £8.05
5 Amp £11.75
8 Amp £15.80
12 Amp £23.80
20 Amp £49.00
8-2500 Panel Mounting
1 Amp £7.00
2.5 Amp £8.05
Please add postage
ALL MODELS INPUT 230 VOLTS, 50/60 CYCLES. OUTPUT VARIABLE 0-260 VOLTS. Special discounts for quantity



RP214 REGULATED POWER SUPPLY
Solid state. Variable output 0-24v DC up to 1 amp. Dual scale meter to monitor voltage and current. Input 220/240V A.C. Size 185 x 85 x 105mm. £8.97. P. & P. 25p.



PS1000B REGULATED POWER SUPPLY
Solid state. Output 6, 9 or 12 volt DC up to 3 amps. Meter to monitor current. Input 220/240V A.C. Size 4" x 3 1/2" x 6 1/4". £11.97. P. & P. 25p.



UNR-30 RECEIVER
4 Bands covering 550Kc/s-30Mc/s. B.F.O. Built-in Speaker 220/240V. A.C. Brand new with instructions. £15.75. Carr. 37p.



LAFAYETTE HA-600 SOLID STATE RECEIVER
General coverage 150-400Kc/s, 550 Kc/s-30Mc/s. FET front end. 2 mech. filters, product detector, variable B.F.O., noise limiter, S. Meter. Bandspread. RF Gain. 15" x 9 1/2" x 8 1/4". 18 lbs. 220/240V. A.C. or 12V. D.C. Brand new with instructions. £45. Carr. 50p.



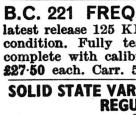
CRYSTAL CALIBRATORS NO. 10
Small portable crystal controlled wavemeter. Size 7 x 7 x 4 in. Frequency range 500 Kc/s-10 Mc/s (up to 30 Mc/s on harmonics). Calibrated dial. Power requirements 300V. D.C. 15mA and 12V D.C. 0.3A. Excellent condition. £4.47. Carr. 37p.



HELICAL POTENTIOMETERS
ITT MCPM15 10 TURN 2 1/2 WATTS
Available 500 ohm, 1K, 5K ohm. £1.25 each P. & P. 15p.



B.C. 221 FREQUENCY METERS
Latest release 125 KHz-20 MHz. Excellent condition. Fully tested and checked and complete with calibrator charts. £27.50 each. Carr. 50p.



SOLID STATE VARIABLE A.C. VOLTAGE REGULATORS
Compact and panel mounting. Ideal for control of lamps, drills, electrical appliances etc. Input 230/240V. A.C. Output continuously variable from 20v-230v. Model MR 2305 5 amp 68 x 46 x 43mm £8.37. £11.97. Postage 12p.



AUTO TRANSFORMERS
0/115/230V. Step up or step down. Fully shrouded.
150 W. £3.87. P. & P. 17p
300 W. £5.25. P. & P. 22p
500 W. £4.97. P. & P. 32p
1000 W. £7.25. P. & P. 37p
1500 W. £8.97. P. & P. 42p
5000 W. £36.00 P. & P. £1

G.W.SMITH & CO. (RADIO) LTD

27 TOTTENHAM CT. RD. LONDON, W.1
3 Lisle Street, London, W.C.2
34 Lisle Street, London, W.C.2
311 EDGWARE ROAD, London, W.2

Tel: 01-636 3715
Tel: 01-437 8204
Tel: 01-437 9155
Tel: 01-262 0387

OPEN 9-6 MONDAY TO SATURDAY

All Mail Orders to 11-12, Paddington Green, London W.2
Tel. 01-262 6562 (Trade supplied)

HAVE YOU TRIED SRBP.

nippiboard

Special offer closes November 30
Two Nippiboards Type 1A or one Type
2AS-25p Four Type 1A or one Type
4AS-40p (add 5p p&p) ALSO S.L. 403D
i.e. £1.99 (add 9p p&p)

Dept NIP ELECTRONICS P.O. BOX 11
NE16 2HZ ST ALBANS, HERTS

LOOK AT THESE PRICES

CARTRIDGES

Acos GP67-2, GP91-35C £1.12½; Acos GP93-1
£1.83½; Acos GP94-1 £1.62½; Sonotone 9TAHC
£1.97½. All above in makers' cartons. BSR X4H
£1.80.

THIS MONTH'S SPECIAL OFFER

Garrard SP25 Mk. III with K940A cartridge.
In good quality teak plinth with perspex dust
cover. Complete with all leads ready to use £20.
SP25 Mk. III deck only less cartridge £12.87.

PLUGS & SOCKETS

Phono plugs, assorted colours 4½p, 45p per doz.;
Coaxial plugs, aluminium 7½p; Coaxial couplers 7½p;
2 pin DIN plugs 15p; 3 pin DIN plugs 15p; 5 pin
DIN plugs 17p; 2 pin, 3 pin & 5 pin DIN sockets 7½p;
Wander plugs 2½p; sockets 3½p; Banana plugs 5½p;
Sockets 5p; 3.5mm J/Plugs 7½p and 12½p; Standard
J/Plugs with solder terminals 10p; Chrome 15p;
Side Entry J/Plugs black and chrome 24p; Insulated
J/sockets—o/cct 20p, c/cct 17p.

ELECTROLYTIC CAPACITORS

4uF 150v 4p; 8uF 500v 15p; 10uF 150v 4p;
12uF 25v 4p; 16uF 450v 14p; 16uF + 16uF
450v 23½p; 30uF 10v 4p; 50uF 10v 4p;
100uF 9v 4p; 100uF 12v 4p; 150uF 12v 4p;
1500uF 30v 10p; 10uF 16v 7½p; 5000uF 25v 50p;
10,000uF 25v 75p; 20,000uF 30v £1.05.

GEORGE FRANCIS (DEPT EE)

12-14, MIDDLE GATE, NEWARK, NOTTS.
Telephone: Newark 4733.

INSTRUMENTAL AUDIO EFFECTS

SUPER "FUZZ" UNIT KIT. CONNECTS
BETWEEN GUITAR & AMPLIFIER. OPER-
ATES FROM 9v BATTERY (not supplied).
ALL COMPONENTS AND PRINTED CIRCUIT
BOARD WITH FULL INSTRUCTIONS. KIT
PRICE: £2-60 post paid.

CREATE "PHASE" EFFECT ON YOUR
RECORDS, TAPES ETC., UNIQUE CIRCUITRY
ENABLES YOU TO CREATE PHASE
EFFECT AT THE TURN OF A KNOB. OPER-
ATES FROM 9v BATTERY (not supplied).
COMPLETE KIT OF COMPONENTS WITH
PRINTED CIRCUIT BOARD & FULL INSTRU-
CTIONS. KIT PRICE: £2-60 post paid.

MAIL ORDER ONLY.

S.A.E. ALL ENQUIRIES.

DABAR ELECTRONIC PRODUCTS

92a, LICHFIELD STREET,
WALSALL, STAFFS. WS1 1UZ

CHROMASONIC electronics

supply only brand new guaranteed goods

LOW NOISE HI-STABS

1 watt 5% all E24 values 3 for 2p plus p. & p. 6p
for up to 50 resistors + 1p for each additional 50.

INTEGRATED CIRCUITS

PA234	85p	MC1304P	£2-50	TAA700	£2-00
PA237	£1-55	MC1305P	£2-50	TAD100	£1-95
PA246	£1-60	MFC4000P	52p	µA709C	45p
SLA03D	£2-12	MFC4010P	75p	µA710	45p
MC1303L	£1-55	TAA661B	£1-90	µA741C	70p

TRANSISTORS & DIODES

AC127/8	17p	BF115	25p	2N3055	55p
AC187/8	30p	BF173	25p	OA81/90/91	7p
AD161	pair	MJE340	87p	OA200	10p
AD162	63p	OC71	15p	IN4001	8p
AF114/5/6/7/8	12p	OC72	17p	IN4004	10p
BC107/9	12p	2N3792/3	12p	IN4005	12p
BC108	11p	2N3704	17p	IN4007	10p
BC147/9	15p	2N3705/6/7	15p	W005	40p
BC148	12p	2N3708/9/10/11	12p	W01	45p
BC158/68	15p		12p	W02	45p
BC157/59	20p	2N1711	25p	BZY88	15p
		2N2926 O/Y	15p		

MULLARD C280 POLYESTER CAPACITORS

·01µF, ·015, ·022, ·033, ·047, 3p, ·068µF 3½p, ·1µF,
·15, 4p, ·22, 5p, ·33, 8½p, ·47, 8p, ·68 11p, 1µF, 13p,
15µF 20p, 2·2µF 24p.

MULLARD ELECTROLYTICS, C428, C431, C437, etc.

2·5µF 6·4v	6p	250µF 25v	10p	1250µF 40v	42p
10µF 16v	6p	250µF 40v	13p	2000µF 25v	42p
25µF 25v	6p	500µF 40v	28p	2500µF 40v	63p
50µF 25v	10p	500µF 64v	38p	2500µF 64v	77p
100µF 16v	4p	1000µF 16v	18p	4000µF 25v	63p
125µF 16v	6p	1250µF 25v	38p	4000µF 40v	77p

MODULES FULLY ALIGNED & TESTED

F.M. STEREO I.F. STRIP	£3-50 + p. & p. 25p
F.M. FRONT END	£2-00 + p. & p. 25p
F.M. STEREO DECODER	£5-25 + p. & p. 25p

GARRARD SP25 Mk.III with 9TAHC £12-72 +
p. & p. 50p.

CARBON TRACK POTS, single gang log or lin 12p,
Dual gang log or lin 40p. Mains Switch + 12p.

SKELETON PRESETS Vert. or Horiz., 0·1w 5p,
0·25w 7p.

MAINS TRANSFORMER. Sec. 20-12·0-12-20V @
0·7A £1·75 + p. & p. 30p.

SWITCHES: Toggle SPST 18p, P/Button SPST 37p.
BULB & HOLDER 6V, 0·06A 15p. CERAMIC CAP.

·01µF 30V 10p, Silvered Mica 25p 7p, 680p 8p.
1972 CATALOGUE 10p, post free

unless indicated, p & p. on all orders is 6p
56 FORTIS GREEN ROAD, LONDON, N10

A LONG COOL LIFE

for your valuable components with the
S.D.C. DeC range of SOLDERLESS breadboards

S-DeC Available as single packs with booklet and
control panel @ £1-44 or the DeCSTOR
double pack containing 2 S-DeCs, booklet,
control panel, all in a plastic storage container.
Only £2-88. A 4 DeC pack is available, only
£5-10.

T-DeC Now available to the amateur, 208 connection
points. 38 independent junctions.
Accommodates I.C.s using standard carriers.
Three times the capability for only twice the
price! Unit pack with control panel £2-88.

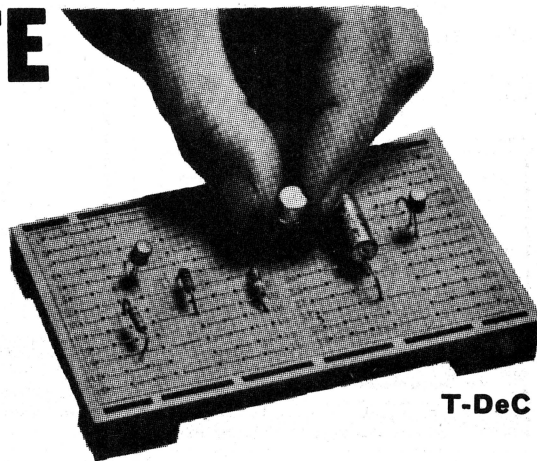
µ-DeC Primarily for use with integrated circuits;
further details on request.

T-DeCs, S-DeCs and Accessories are all
obtainable from leading suppliers
throughout the U.K.

ART WORK

In case of difficulty complete the coupon
and mail without delay. Post to:

S.D.C. ELECTRONICS (SALES) LTD.
34 Arkwright Road, Astmoor Industrial
Estate, Runcorn, Cheshire
Tel.: Runcorn 65041



T-DeC

Please send me:

.....T-DeC PackS-Dec Single Pack
.....DeCSTOR Pack4-DeC Pack

Tick here if you require further details of the µ-DeC

I enclose PO/Cheque/Money Order value £
Money refunded if not satisfied

Name

Address

Build yourself a TRANSISTOR RADIO

NEW! ROAMER 10 WITH VHF INCLUDING AIRCRAFT

10 TRANSISTORS. 9 TUNABLE WAVEBANDS, MW1, MW2, LW, SW1, SW2, SW3, TRAWLER BAND. VHF AND LOCAL STATIONS AND AIRCRAFT BAND

Built in Ferrite Rod Aerial for MW/LW. Retractable, chrome plated 7 section Telescopic Aerial, can be angled and rotated for peak short wave and VHF listening. Push Pull output using 600mw Transistors. Car Aerial and Tape Record Sockets. Switched Earpiece Socket complete with Earpiece. 10 Transistors plus 3 Diodes. 7in x 4in Speaker. Air Spaced ganged Tuning Condenser with VHF section. Volume on/off, Wave Change and Tone Control. Attractive Case in black with silver blocking. Size 9" x 7" x 4". Easy to follow instructions and diagrams. Parts price list and easy build plans 30p (FREE with parts).

Total building cost

£8-50

P. P. & Ins. 50p

(Overseas P. & P. £1)

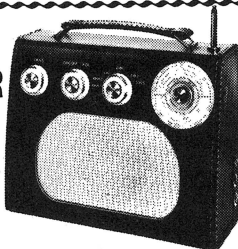


ROAMER EIGHT Mk I

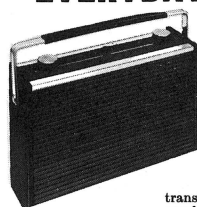
NOW WITH VARIABLE TONE CONTROL

7 Tunable Wavebands: MW1, MW2, LW, SW1, SW2, SW3 and Trawler Band. Built in Ferrite Rod Aerial for MW and LW. Retractable chrome plated Telescopic aerial for Short Waves. Push pull output using 600mw transistors. Car aerial and Tape record sockets. Selectivity switch. Switched earpiece socket complete with earpiece. 8 transistors plus 3 diodes. 7in. x 4in. Speaker. Air spaced ganged tuning condenser. Volume/on/off, tuning, wave change and tone controls. Attractive case in rich chestnut shade with gold blocking. Size 9 x 7 x 4in. approx. Easy to follow instructions and diagrams. Parts Price List and Easy Build Plans 25p (FREE with parts).

Total building cost **£6-98** P. P. & Ins. 41p.
(Overseas P. & P. £1)



Exclusive to readers of "EVERYDAY ELECTRONICS" "EVERYDAY SEVEN"



MEDIUM and LONG WAVE PORTABLE. Specially designed circuit for easy construction incorporating 7 transistors and 2 diodes, air spaced tuning capacitor, push pull output using 600 mw transistors, heavy duty loudspeaker for quality sound and

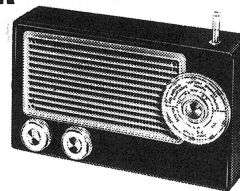
room filling volume, internal Ferrite Rod aerial, Volume/on/off control, tuning control and wave change switch. Handsome, strongly made wooden case, size 11½" x 7½" x 3½" with carrying handle and black knobs with spun silver inserts. The ideal radio for those who are comparatively inexperienced in electronic construction. Easy build plans are supplied free with parts or available separately for 25p.

Total building costs **£4-98** P. P. & Ins. 41p.
(Overseas Post £1)

ROAMER SIX

6 Tunable Wavebands: MW, LW, SW1, SW2, Trawler band plus an extra M.W. band for easier tuning of Luxembourg etc. Sensitive ferrite rod aerial and telescopic aerial for Short Waves. 3in. Speaker. 8 stages—6 transistors and 2 diodes including Micro-Alloy R.F. Transistors, etc. Attractive black case with red grille, dial and black knobs with polished metal inserts. Size 9 x 5½ x 2½in. approx. Easy build plans and parts price list 15p (FREE with parts). Earpiece with plug and switched socket for private listening 30p extra.

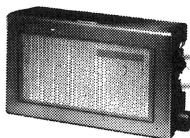
Total building costs **£3-98** P. P. & Ins. 26p.
(Overseas P. & P. £1)



POCKET FIVE

3 Tunable Wavebands: MW, LW, Trawler Band with extended M.W. band for easier tuning of Luxembourg, etc. 7 stages—5 transistors and 2 diodes, supersensitive ferrite rod aerial, fine tone moving coil speaker. Attractive black and gold case. Size 5½ x 1½ x 3¼in. Easy build plans and parts price list 10p (FREE with parts). Earpiece with plug and switched socket for private listening 30p extra.

Total building costs **£2-23** P. P. & Ins. 21p.
(Overseas P. & P. 63p)

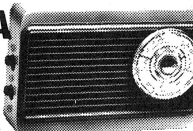


TRANSONA FIVE

NOW WITH 3in SPEAKER

3 Tunable Wavebands: MW, LW and Trawler Band. 7 stage—5 transistors and 2 diodes, ferrite rod aerial, tuning condenser volume control, fine tone 3in. moving coil speaker. Attractive case with red speaker grille. Size 6½ x 4½ x 1¼in. Easy build plans and parts price list 10p (FREE with parts). Earpiece with plug and switched socket for private listening 30p extra.

Total building costs **£2-50** P. P. & Ins. 22p.
(Overseas P. & P. 63p)

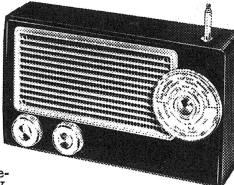


TRANS EIGHT

8 TRANSISTORS and 3 DIODES

6 Tunable Wavebands: MW, LW, SW1, SW2, SW3 and Trawler Band. Sensitive ferrite rod aerial for M.W. and L.W. Telescopic aerial for Short Waves. 3in. Speaker. 8 improved type transistors plus 3 diodes. Attractive case in black with red grille, dial and black knobs with polished metal inserts. Size 9 x 5½ x 2½in. approx. Push pull output. Battery economiser switch for extended battery life. Ample power to drive a larger speaker. Parts price list and easy build plans 25p (FREE with parts). Earpiece with plug and switched socket for private listening 30p extra.

Total building costs **£4-48** P. P. & Ins. 31p.
(Overseas P. & P. £1)



NEW! "EDU-KIT"

BUILD RADIOS, AMPLIFIERS, ETC., FROM EASY STAGE DIAGRAM. FIVE UNITS INCLUDING MASTER UNIT TO CONSTRUCT

COMPONENTS INCLUDE:
Tuning Condenser: 2 Volume Controls: 2 Slider Switches: 4"x2½" Speaker: Terminal Strip: Ferrite Rod Aerial: 3 Plugs and Sockets: Battery Clips: 4 Tag Boards: Balanced Armature Unit: 10 Transistors: 4 Diodes: Resistors: Capacitors: Three ½" Knobs.
Units once constructed are detachable from Master Unit, enabling them to be stored for future use. Ideal for Schools, Educational Authorities and all those interested in radio construction

All parts including Case and Plans **£5-50** P. P. & Ins. 31p.
(Overseas P. & P. £1)

FULL AFTER SALES SERVICE

* Callers side entrance Barratts Shoe Shop
* Open 10-1, 2.30-4.30 Mon.-Fri. 9-12 Sat.

RADIO EXCHANGE CO

61 HIGH STREET, BEDFORD. Tel. 0234 52367

I enclose £..... please send items marked

ROAMER TEN	<input type="checkbox"/>	EVERYDAY SEVEN	<input type="checkbox"/>
ROAMER EIGHT	<input type="checkbox"/>	TRANS EIGHT	<input type="checkbox"/>
TRANSONA FIVE	<input type="checkbox"/>	ROAMER SIX	<input type="checkbox"/>
POCKET FIVE	<input type="checkbox"/>	EDU-KIT	<input type="checkbox"/>

Parts price list and plans for

Name

Address

EE.2